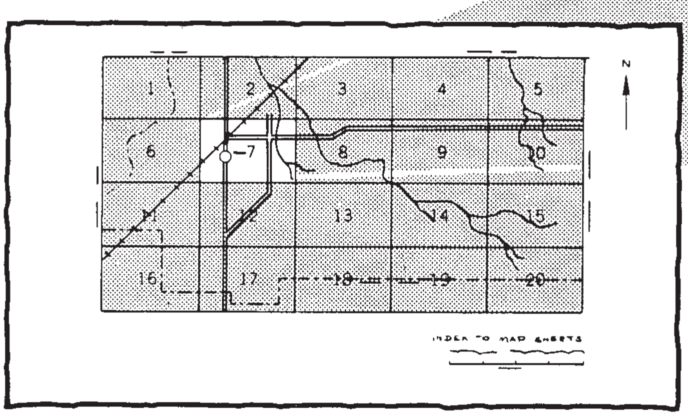
SOIL SURVEY OF

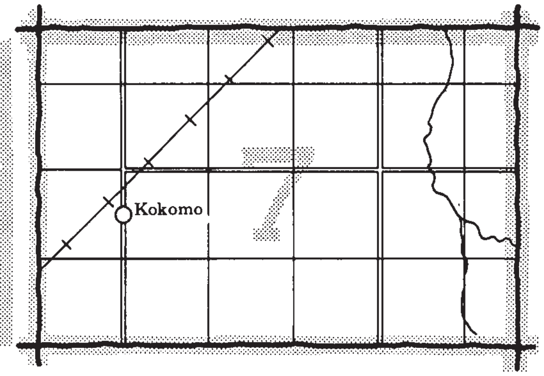
Jefferson County, Wisconsin

U. S. Department of Agriculture, Soil Conservation Service,
in cooperation with
Research Division of the College of Agricultural and Life Sciences,
University of Wisconsin

HOW TO USE

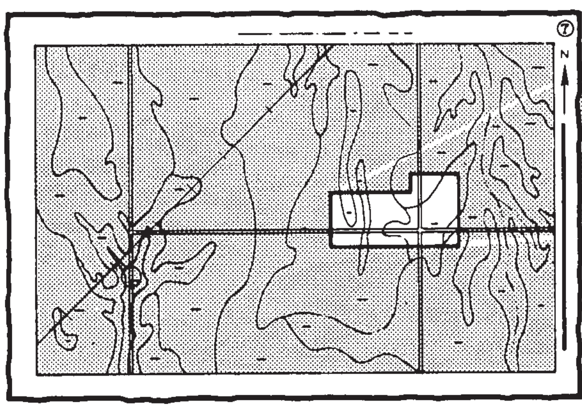
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

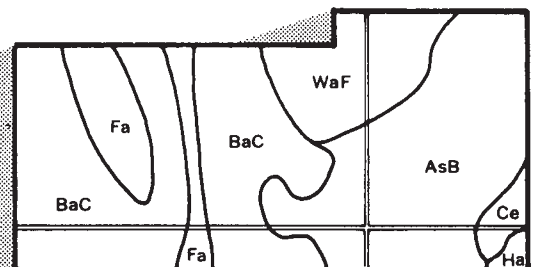




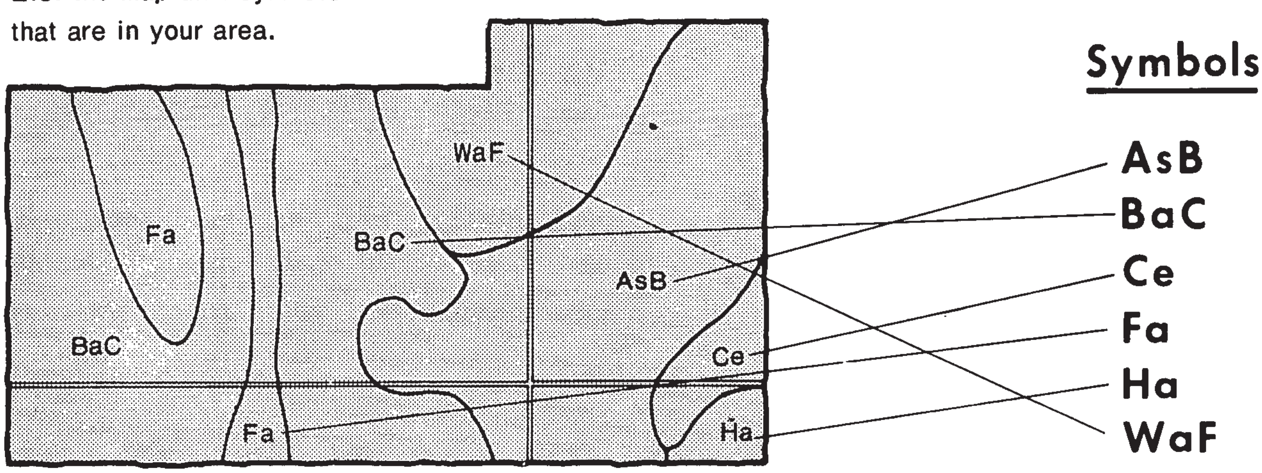
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



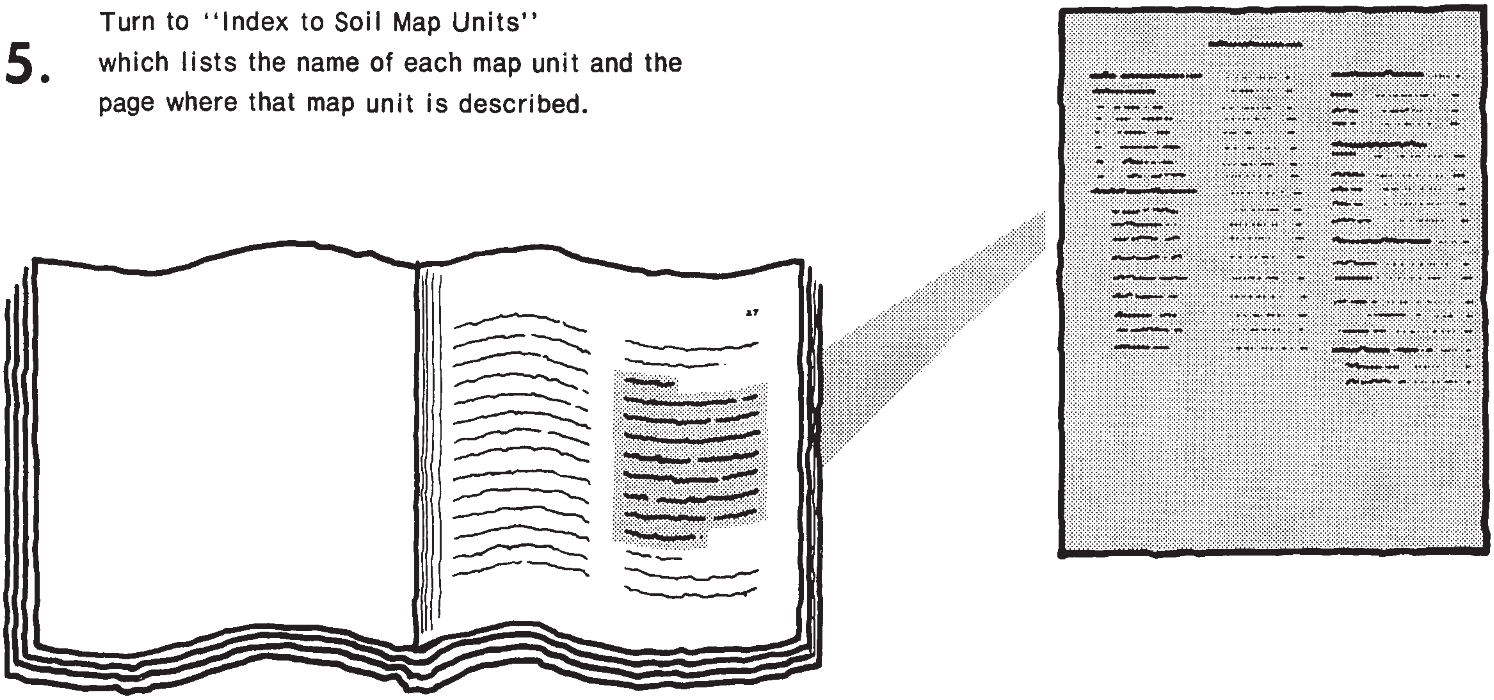


4. List the map unit symbols that are in your area.

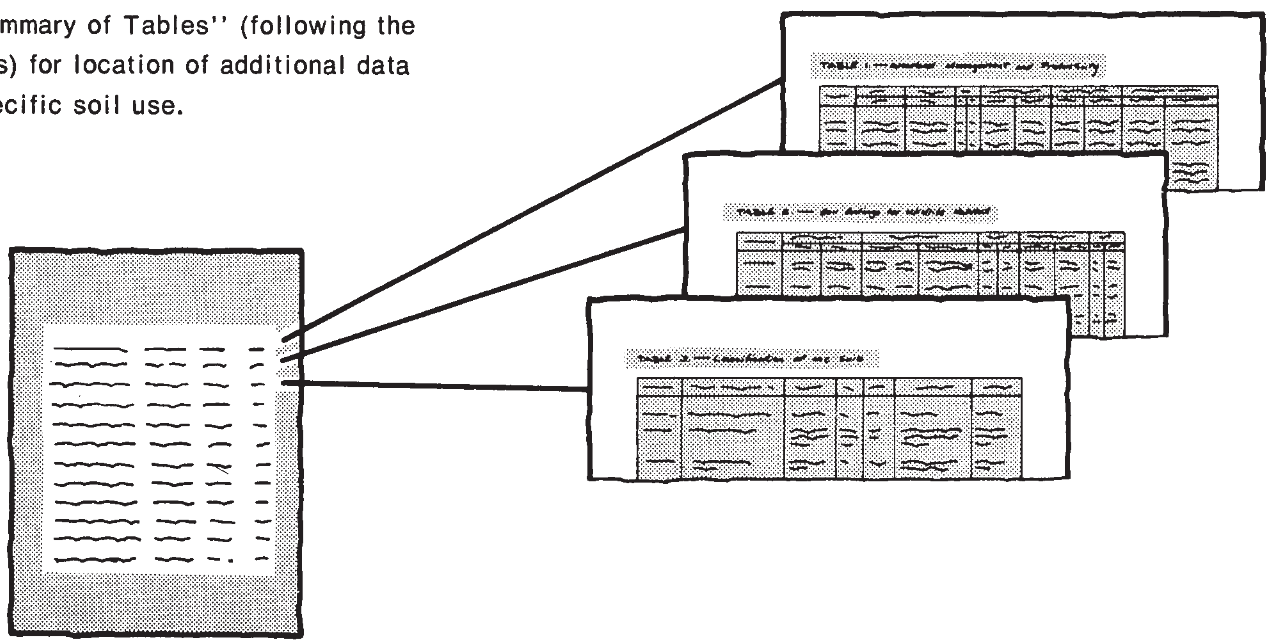


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1971-75. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. It is part of the technical assistance furnished to the Jefferson County Soil and Water Conservation District, which helped to finance the mapping.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Kidder soils on a typical drumlin landscape in Jefferson County. Drumlins are long hills alined in the direction that a glacial ice sheet moved over the county. All photos courtesy of Dale Lang, Jefferson, Wisconsin.

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Issued June 1979

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Foreword

I would like to introduce the Soil Survey of Jefferson County, Wisconsin. You will find herein basic information useful for any land management program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land use will have on the environment.

This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan use of land, select sites for construction, develop soil resources, and identify any special practices that may be needed to assure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, or pollution control can use the soil survey to help understand, protect, and enhance the environment.

Soils vary greatly in their physical and chemical characteristics. Many people assume soils are all very similar. They are unaware that great differences in soil properties can occur within even short distances.

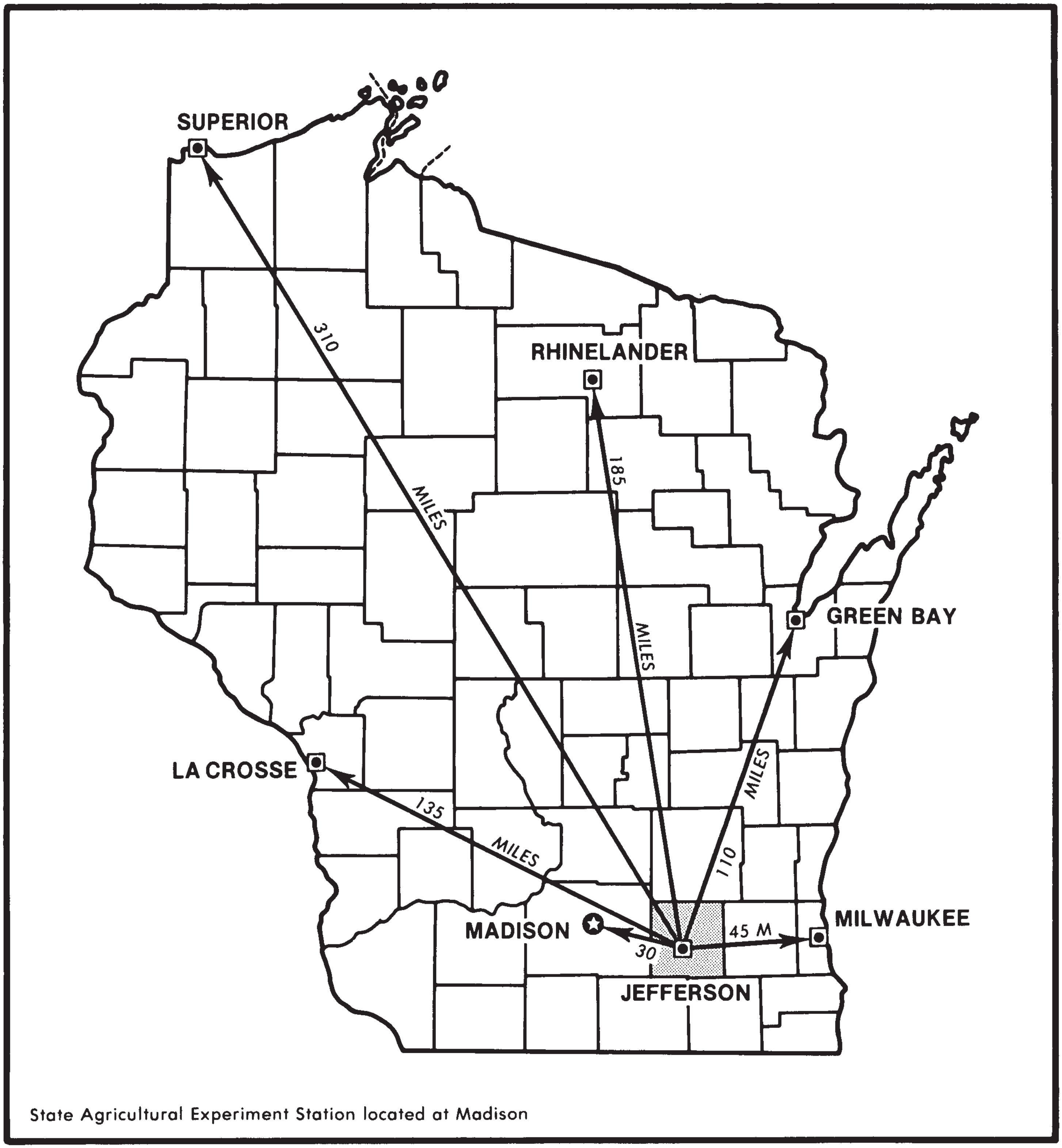
Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be unstable, and as a result, have severe limitations as a foundation for buildings or roads. They may be poorly suited to septic tank absorption fields. Some have a high water table, which makes them poorly suited as sites for houses with basements or for underground installations.

This soil survey report describes these and many other soil properties that affect land use. It also shows, on the general soil map, the location of broad areas of soils; the location of each kind of soil is shown on detailed soil maps at the back. The publication provides descriptions of each kind of soil in the survey area, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained at the local office of the Soil Conservation Service or the Cooperative Extension Service.

I believe that this soil survey will serve as a valuable resource to help improve the environment and provide a better life for all citizens. The widespread use of this information will greatly assist in the conservation, development, and productive use of soil, water, and related resources.

J. C. Hytry

J. C. Hytry
State Conservationist



Location of Jefferson County in Wisconsin.

SOIL SURVEY OF JEFFERSON COUNTY, WISCONSIN

By Carl L. Glocker, Soil Conservation Service

Fieldwork by James E. Ayen, Carl L. Glocker, David L. Omernik, Joseph A. Steingraeber, Stephen C. Suhs, and Bruce G. Watson, Soil Conservation Service

Other Contributors are David A. Medin and Robert A. Patzer

U. S. Department of Agriculture, Soil Conservation Service, in cooperation with Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

JEFFERSON COUNTY is in southeastern Wisconsin (see facing page). It has a total land area of 360,960 acres and has 13,440 acres of water. It is an area of farms, small cities, and villages. Manufacturing is diversified, and dairying is the major agricultural industry.

Only 9 percent of the land area of the county is woodland, compared with a statewide average of 43 percent. The most common species are oak, elm, and maple. The principal minerals marketed are sand and gravel and crushed limestone (*12*).

Proper management of farmland to control erosion, remove excess water, minimize chemical pollution, and maximize economic returns is necessary if farming is to remain a major industry. Manufacturing and the demand for services have increased the need for town and country planning. Problems related to flood control, water supply, pollution by chemicals and by sediment, sewage disposal, parks and open space, residential development, and transportation systems are increasing rapidly. This soil survey provides a basis for onsite and area-wide land use planning by supplying an inventory of facts concerning the soils throughout the county. If this information is used, decisions that resolve existing problems and avoid future ones can be made.

General nature of the county

This section gives general information concerning the county. It describes climate; geology and underlying material; physiography, relief, and drainage; water supply; history and development; and transporation and industry.

Climate

The climate of Jefferson County is continental. It is characterized by the marked changes in weather common to the latitude and to the interior of a large land mass. There is a tendency for extremes in all of the climatic elements. Spring often comes late in the year and is a mixture of warm and cold periods. As spring advances, precipitation is less frequent and more intense. Summers are warm and have several hot and humid periods, which last for only a few days. Cool periods generally occur during any summer month. Dew is often heavy and forms on a majority of mornings. Fall arrives suddenly in mid-September and often lingers on into November. After the first killing freeze, there are, nearly every year, periods when days are abnormally warm and clear or sunny but hazy and nights are cool. The change from fall to winter is often abrupt.

Jefferson County, on the northern edge of the corn belt, is mainly an area of dairy farms and a considerable acreage of peas and sweet corn. Most of the crops, except for field corn, are cool-weather crops. The county lies about 50 miles southeast of the "tension zone" boundary between the severe and the moderate temperature continental climatic zones. In this zone, conifer forest and mixed broadleaf forest were originally predominant. The southern part of the county lies in another tension zone—that between broadleaf forest and grassland.

The average date of the last freeze in spring is May 4, and that of the first in fall is October 5. The growing season, or the number of days between the last freeze in spring and the first in fall, averages 154 days. There is a slight variation within the county, depending on nearness to water and whether the location is a valley or a hilltop or slope.

Precipitation is normally adequate for farming, but some degree of soil moisture deficiency usually occurs in July and August. Severe drought affecting all crops is rare. Most of the summer precipitation falls as showers that vary in length and intensity. A sequence of 3 or more dry days, or days having less than 0.10 inch of rain, is important in curing hay in the field. The probability of such a sequence is 50 percent in June and 60 percent in July and August.

Hail falls on an average of 2 days a year. It is more frequent in May than in any other month, and then in April, June, and July. Hail large enough to damage crops and property is generally limited to the period mid-May to mid-August.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Fort Atkinson for the period 1942 to 1959. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring.

In December, January, and February, the average temperature is 22 degrees F, and the average daily minimum temperature is 14 degrees. The lowest temperature on record, which occurred at Fort Atkinson in 1951, is minus 33 degrees. In summer the average temperature is 71 degrees, and the average daily maximum temperature is 81 degrees in June, July, and August. The highest recorded temperature, which occurred in August 1955, is 100 degrees.

The total annual precipitation is 29.7 inches. Of this total, 60 percent usually falls in May through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in May through September is less than 11 inches. The heaviest 1-day rainfall during the period of record was 3.52 inches at Fort Atkinson in July 1952. Thunderstorms occur on about 41 days each year, and most occur in June and July.

Average seasonal snowfall is 32.1 inches. The greatest snowfall in any winter during the period of record was 66 inches. The average date of the first snowfall of 1 inch or more is November 27. In 1 year out of 10, snow falls by November 3. In 9 years out of 10, it falls by December 26.

The percentage of possible sunshine is 60 in summer and 40 in winter. The prevailing wind is from the west in winter and south in summer. Average windspeed is highest, 12 miles per hour, in March, April, and November.

Geology and underlying material

Bedrock.—The lime (carbonate of calcium and magnesium) naturally occurring in the subsoils of Jefferson County was derived by geologic agencies from dolomite formations. This bedrock is at the surface in a few places. Whalan soils are in areas where depth to bedrock is only 20 to 40 inches (fig. 1). Two sandstones underlie parts of the western half of the county. The narrow band of Cambrian sandstone lies at the bottom of a buried valley leading from the vicinity of Jefferson to Lake Koshkonong. Precambrian rock, which is called Waterloo quartzite, crops out in northwestern Jefferson County. It has scratches and polished surfaces formed by the continental glaciers that advanced over the area more than 14,000 years ago. The low lying quartzite exposure is the top of an ancient hill almost entirely buried by sediments.

Surficial deposits.—The unconsolidated deposits include glacial till; outwash deposited by melt water; lake-laid clay, silt, and sand; and accumulations of peat and windblown silts. The mineral material was derived largely from local bedrock but also from Precambrian rocks of the Canadian shield. An unusually reddish glacial till in a drumlin on the west county line at Highway I-90 is thought to have been derived by the glacier from reddish residual material at the base of the St. Peter sandstone. With this exception, the till of the county is uniformly dark yellowish brown and is sandy loam. The till ranges in carbonate content from 20 percent in the western part of the county, where dilution of pulverized dolomite by sandstone debris is greatest, to nearly 45 percent toward the northern and eastern parts, where the till overlies Platteville-Galena dolomite bedrock. About 96 percent of the carbonate is dolomite, and the rest is calcite. Much of the till appears to be ice-reworked outwash. The content of boulders and stones varies locally.

Evidence indicates that a glacial lobe advanced southward from Green Bay across the county in Woodfordian (Cary) time about 15,000 years ago. Spruce wood collected during this soil survey from the base of a peat mound just south of the Scuppernong River yielded a carbon-14 date of 12,800 years, plus or minus 220 years, in the University of Wisconsin Center for Climatic Research. A leached loess mantle on the glacial drift is particularly extensive in the northern half of the county. The mantle typically thickens from hillcrest to swale. Sand coverings are extensive on the flanks of hills and ridges of the Kettle Moraine belt, where Chelsea and Moundville loamy sands formed in association with Rodman gravelly soils. Local alluvial deposits lie in patches along streams and on the foot slopes of drumlins. Many kettles have somewhat deep silty deposits. The clay in lacustrine basins is mineralogically similar to the sparse clay in the nearby till.

Physiography, relief, and drainage

Jefferson County is drained by the Rock River. The major feeder streams are the Crawfish, Bark, Scuppernong, and Oconomowoc Rivers and Whitewater, Koshkonong, and Deer Creeks. The location of the Rock River seems to be controlled by dolomite and by damming with glacial drift. Restricted flow through the Johnstown terminal moraine resulted in Lake Koshkonong and associated wetlands. Natural highs associated with the Kettle Moraine and the terminal moraine have forced all flow to the west. Large and small streams meander throughout the county, generally because ice has dammed and drift plugged natural water sources. Where melt water was unable to deepen channels sufficiently, marshes and shallow lakes have formed, as is shown by the high percentage of wetlands in the county.

Landforms are basically glacial drift features. The northern third of the county has one of the three classic drumlin fields in the United States. These oval hills, sometimes called whalebacks, have tapered extensions to the leeward of iceflow. These extensions point in the direction of flow groups. Some drumlins are double tailed or even triple tailed with subordinate overlapping crests. Low concave depressions are between the drumlins. These depressions are either glacial spillways or old lake basins and associated terraces.

The large outwash plain that stretches from south of Lake Ripley to just north of Lake Mills displays all the

features of a stream-built, or melt-water, terrace. The tremendous volume of water was no longer evident after the ice melted, and the terrace now stands high above waterways. Water apparently trapped by the Kettle Moraine to the east and the terminal moraine to the south and east formed large areas of shallow lakes that long since have drained away, resulting in large areas that are low and nearly flat.

The southeast corner of the county is in an area known as the "Kettle Moraine." This area is made up of kames and many kettle holes or potholes. The topography is complex. The soils are generally too steep for cultivated crops. Directly west of the "Kettle Moraine" is another large glacial lake basin that includes most of Palmyra, Cold Spring, Hebron, and Sullivan Townships.

Water supply

All of Jefferson County is in the Rock-Fox River basin. This basin includes all or parts of 13 counties in south-central Wisconsin. It also includes the area drained by the Rock, Fox, and Des Plaines Rivers (*4*). The rolling landscape is shaped by the surface of the underlying bedrock and by glacial deposits of varying thickness.

Bedrock furnishes most of the ground water for the basin. Precambrian rocks, the oldest rocks in the basin, are overlain by layered sedimentary rocks of marine origin, mostly sandstone and dolomite. The pattern of formations was created by erosion, which exposed the older rock, and by a regional dip of the formations to the east and southeast. The rock units are not uniform in thickness or composition throughout the basin. The thickness varies, especially in the Cambrian sandstones, which range from a few hundred feet thick in the northern part of the basin to an estimated 3,000 feet thick in the southwestern part. The composition also varies within the formation. For example, the Trempealeau Group is mostly sandstone in the northwestern part of the basin and mostly dolomite in the souteastern part.

Glacial drift, which stores water for release to wells and streams, overlies the bedrock in all areas throughout the basin but the small rock exposures on hilltops, hillsides, streambanks, and road cuts. The character and thickness of the drift determines the recharge, storage, and discharge of ground water. The type of drift partly controls the kind of soil that forms on its surface. The shape of the surface controls the drainage pattern. The drift has a maximum thickness of 500 feet in the southeast corner. It is generally thin in the northern and western parts of the basin and thick in the southern part. It is thickest in areas where it fills valleys in the surface of the bedrock and where it is on prominent end moraines.

The Precambrian crystalline rocks are not generally classed as aquifers. A few wells, however, obtain a small quantity of water from small fractures in this geologic unit.

The sandstone aquifer, which overlies crystalline rock, is the most important aquifer in Jefferson County. It underlies the entire county and consists of several geologic units. Properly constructed wells in the lower units of this formation can yield 1,000 gallons of water or more per minute. Wells in the upper part of this aquifer yield 10 to 250 gallons per minute.

The Platteville-Galena aquifer underlies the eastern half of Jefferson County. It is widely used for domestic and farm water supplies in areas where it is covered by a thin layer of drift but yields little water to wells in areas where it is deeply buried, particularly where it underlies Maquoketa shale. Properly constructed wells yield 10 to 100 gallons of water per minute.

The availability of water from glacial deposits varies widely within small areas. The best glacial drift aquifers are thick sand and gravel outwash deposits. These deposits are at or near the surface, or they are buried beneath less permeable deposits. Buried sand and gravel deposits occur throughout the county, but their extent is not well known. Several thousand gallons of water per minute have been obtained from drilled wells in outwash sand and gravel in areas, such as those along the Rock River, where the aquifer is thick and underlies a perennial stream. Small yields of water have been developed where the deposits are thin or local in extent.

The clay and silt deposited in glacial lakes restrict water movement and are not good aquifers.

In Jefferson County glacial drift aquifers are the main source of ground water discharge to streams. The aquifers are recharged by rainfall, which averages approximately 30 inches per year. Seasonal and long term climatic variations cause fluctuations in stream levels and ground water levels.

History and development

Prior to settlement by Europeans, the area now called Jefferson County was occupied by various Indian tribes, including a tribe that built a stockaded village at Aztalan. French fur traders traveled extensively in the area during this time.

The Wisconsin Territorial Legislature organized Jefferson County from a part of Milwaukee County in 1836. The county was named in honor of Thomas Jefferson, third president of the United States. In 1856, a tier of five townships was added from Dodge County, but this action was reversed in 1858. The Rock River Claim Company was instrumental in establishing the village of Hebron and the cities of Ft. Atkinson and Watertown in 1836.

Settlers moved in rapidly after completion of the land surveys and the opening of land sales in Milwaukee in 1839. The population of the county rose from 468 in 1836 to 34,800 in 1900, 43,000 in 1950, and 60,000 in 1970. The number of farms has declined steadily from a high of 3,500 in 1900 to 2,100 in 1970. The average size of farms rose from 98 acres in 1900 to 133 acres in 1970.

Subsistence farming supplemented by hunting and fishing was dominant until about 1845. Then sawmills at waterpower sites were converted to flour mills. Livestock and wheat became the important farm products. Dairying gradually increased; by 1870, it was a major industry.

Transportation and industry

Constant improvement of railroads and highways and an abundance of clean water assisted the rise of manufacturing in Jefferson County until 1964, when 54 percent of the labor force worked in manufacturing, 18 percent in retail trade, 12 percent in service-oriented business, and 10 percent in agribusiness. Jefferson County has gained factory jobs at a rapid rate and is now among the most industrialized counties in Wisconsin. In 1969, there were 128 factory jobs per 1,000 population, which is above the State average of 118. Almost four times as many Jefferson County residents have manufacturing jobs as have farm employment. Farming, however, still accounted for 10 percent of the county work force in 1970, compared with only 6.5 percent throughout the State. Jobs in transporation and utilities and in other services were still proportionately few in 1970.

Manufacturing made above average gains in the period 1963 to 1967, in terms of the number of employees, the payroll, and the value added. Products made by the larger firms vary; they include shoes, food, machinery, business machines, meat products, malt, lighting fixtures, dairy equipment, industrial process ovens, and furniture. Milk product plants were established in the county early in Wisconsin's emergence as a dairying state. Canning of vegetables was once more important than it is now. Knitting mills and shoe factories have long been a part of the industry in the county.

Rail service is furnished by the two railroads. The county has regionally important north-south highways and two major east-west highways, Interstate 94 and U.S. Highway 18, which pass through Jefferson County and link Milwaukee and Madison. Scheduled flights via commercial airlines are available at Madison and Milwaukee (*11*).

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land-use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land-use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most

part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

1. Houghton-Adrian

Very poorly drained, nearly level organic soils that are more than 51 inches thick or are underlain by sandy material within a depth of 51 inches

This map unit is mostly in broad depressions in old glacial lake basins where the soils formed in decomposed vegetation that accumulated in shallow water.

This map unit makes up about 9 percent of the county. It is about 80 percent Houghton soils, 10 percent Adrian soils, and 10 percent minor soils.

Houghton soils are in depressions in old glacial lake basins. They are very poorly drained and nearly level. Typically, the organic layer is black, very dark brown, very dark grayish brown, and very dark gray muck about 72 inches thick.

Adrian soils are in the depressions in stream valleys and in old glacial lake basins. They are very poorly drained and nearly level. Typically, the organic layer is black muck about 34 inches thick. The substratum to a depth of about 60 inches is grayish brown medium sand.

Minor in this map unit are Edwards, Palms, and Sebewa soils and the Watseka Variant. The very poorly drained Edwards soils are in depressions in old glacial lake basins. The very poorly drained Palms soils are in depressions in old lake basins. The poorly drained and very poorly drained Sebewa soils are in depressions in outwash plains. The somewhat poorly drained Watseka Variant is in old lake basins and on stream terraces.

Drained areas of this map unit are used for corn and specialty crops. Undrained areas are used for pasture or wetland wildlife habitat. A high water table, low fertility, and subsidence are the main concerns of management. Drained areas are subject to soil blowing and subsidence. The soils are slow to warm in spring and quick to cool in fall. They are subject to frost.

If adequately drained, the major soils in this map unit have fair or good potential for corn and for specialty crops, such as mint, carrots, onions, beets, and other vegetables. Wetness is such a severe limitation and is so difficult to overcome that the potential for residential and other urban uses is poor. The potential for development of wetland wildlife habitat is good.

2. Fox-Casco-Matherton

Somewhat poorly drained, well drained, and somewhat excessively drained, nearly level to very steep soils that have a loamy subsoil and are underlain by sand and gravel

This map unit is mostly nearly level to sloping soils on outwash plains and terraces and some steeper soils on kames, eskers, and terrace escarpments.

This map unit makes up about 22 percent of the county. It is about 26 percent Fox soils, 12 percent Casco soils, 12 percent Matherton soils, and 50 percent minor soils.

Fox soils are on outwash plains and terraces. They are well drained and are nearly level to sloping. Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 23 inches thick. It is dark yellowish brown silt loam and silty clay loam in the upper part and brown clay loam and sandy clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown and light yellowish brown, stratified sand and gravel.

Casco soils are on outwash plains and terraces. They are well drained and somewhat excessively drained and are gently sloping to very steep. Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 15 inches thick. It is yellowish brown and dark brown sandy clay loam in the upper part and brown sandy loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel.

Matherton soils are on terraces and outwash plains. They are somewhat poorly drained and are nearly level and gently sloping. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown, mottled silt loam; the middle part is brown and grayish brown, mottled sandy clay loam and clay loam; and the lower part is brown, mottled loamy sand. The substratum to a depth of about 60 inches is light gray, stratified sand and gravel.

Minor in this map unit are Boyer and Rodman soils and the St. Charles soil that is moderately well drained and has a gravelly substratum. The well drained Boyer soils and the excessively drained Rodman soils are on outwash plains. The St. Charles soil is on terraces and outwash plains.

Most areas of this map unit are cultivated. The commonly grown crops are alfalfa and clover hay, small grain, and corn. Uncultivated areas are pastured or wooded. Controlling erosion and maintaining tilth and fertility are management concerns if the major soils are cropped. For many of the commonly grown crops, the root zone in Casco soils is limited by the underlying sand and gravel. Available water capacity is low in the Casco soils, and management that increases the infiltration rate and conserves moisture is important.

The major soils have fair to good potential for the commonly grown farm crops. They have fair to good potential for residential and other urban uses. As a result of very rapid permeability in the underlying sand and gravel, pollution of ground water is a hazard if the soils are used as sites for waste disposal.

3. Palms-Keowns-Milford

Poorly drained and very poorly drained, nearly level soils that are organic or have a loamy or clayey subsoil; underlain by silty, sandy, or clayey material

This map unit is on terraces and in depressions in old lake basins.

This map unit makes up about 26 percent of the county. It is about 15 percent Palms soils, 14 percent Keowns soils, 11 percent Milford soils, and 60 percent minor soils.

Palms soils are in depressions in old lake basins. They are very poorly drained and nearly level. Typically, the surface layer is about 31 inches of black muck. The substratum to a depth of about 60 inches is dark gray and dark grayish brown silt loam.

Keowns soils are in old lake basins. They are poorly drained and nearly level. Typically, the surface layer is about 7 inches of black silt loam over 3 inches of very dark gray fine sandy loam. The subsoil is about 9 inches thick. The upper part is olive gray fine sandy loam, and the lower part is light olive gray silt loam. The substratum to a depth of about 60 inches is light gray, stratified silt and very fine sand.

Milford soils are on terraces in old lake basins. They are poorly drained and very poorly drained and are nearly level. Typically, the surface layer is black silty clay loam about 11 inches thick. The subsoil is about 17 inches thick. It is dark gray silty clay loam in the upper part; light brownish gray, mottled silty clay in the middle part; and light brownish gray, mottled silty clay loam in the lower part. The substratum to a depth of about 60 inches is light brownish gray and gray, mottled, stratified silt and clay.

Minor in this map unit are Aztalan, Hebron, Martinton, Saylesville, and Yahara soils. Aztalan soils are somewhat poorly drained, Hebron soils well drained and moderately well drained, Martinton soils somewhat poorly drained, Saylesville soils moderately well drained, and Yahara soils somewhat poorly drained. All of the minor soils are on terraces in old lake basins and are above areas of Palms, Keowns, and Milford soils.

Most drained areas of the major soils are cultivated. Corn and soybeans are the most commonly grown crops. A seasonal high water table, moderately slow permeability, and poor tilth in the Milford soils are the main concerns of management if cultivated crops are grown. Tile drains and open ditch drainage can remove excess water. Low fertility, poor tilth, and micronutrient deficiencies are important concerns in managing the major soils. Undrained areas are used for unimproved pasture or are idle. For many of the commonly grown crops, the root zone is limited by the seasonal high water table and by stratified lake-laid sediments. Management that lowers the water table, reduces the risk of flooding, and improves tilth is important.

If adequately drained, the major soils have fair to good potential for the commonly grown crops. Wetness is such a severe limitation and is so difficult to overcome that the potential for residential and other urban uses is poor. The potential for development of wetland wildlife habitat is good.

4. Wacousta-Lamartine-Theresa

Very poorly drained, poorly drained, somewhat poorly drained, and well drained, nearly level to sloping soils that have a silty or loamy subsoil and are underlain by silt loam, sandy loam, or gravelly sandy loam

This map unit is mostly on till plains, drumlins, and terraces in old lake basins and in low areas between drumlins.

This map unit makes up about 20 percent of the county. It is about 20 percent Wacousta soils, 20 percent Lamartine soils, 6 percent Theresa soils, and 54 percent minor soils.

Wacousta soils are on terraces in old lake basins and in low areas between drumlins. They are very poorly drained and poorly drained and are nearly level. Typically, the surface layer is about 9 inches of black silty clay loam over 4 inches of very dark gray silty clay loam. The subsoil is olive gray, mottled silty clay loam about 6 inches thick. The substratum to a depth of about 60 inches is gray and light gray silt loam that is stratified with a few thin layers of fine sandy loam in the lower part.

Lamartine soils are on the side slopes on ground moraines and drumlins. They are somewhat poorly drained and gently sloping. Typically, the surface layer is about 9 inches of very dark grayish brown silt loam over 2 inches of brown silt loam. The subsoil is about 19 inches thick. The upper part is brown, mottled silt loam; the middle part is dark brown, mottled silty clay loam; and the lower part brown, mottled clay loam. The substratum to a depth of about 60 inches is light yellowish brown, mottled sandy loam.

Theresa soils are on till plains and drumlins. They are well drained and gently sloping and sloping. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. It is brown silt loam in the upper part; dark yellowish brown, firm silty clay loam in the middle part; and brown, firm clay loam and yellowish brown loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam.

Minor in this map unit are Barry, Dodge, Mayville, Rotamer, Kibbie, Sisson, and Wauconda soils. The poorly drained Barry soils are in depressions in till plains. The

well drained Dodge soils are on glaciated uplands. The somewhat poorly drained Kibbie soils are in old lake basins and on outwash plains. The moderately well drained Mayville soils are on ground moraines and drumlins. The well drained Rotamer soils are on side slopes on drumlins and glacial uplands. The well drained Sisson soils and the somewhat poorly drained Wauconda soils are on terraces in old lake basins.

Most of the acreage of this map unit is used for dairy farming. The major soils are suited to alfalfa and bromegrass hay, small grain, and corn. The soils that are not cultivated are mostly steep or wet and are wooded or in unimproved pasture. Controlling erosion and maintaining tilth are important management concerns. Providing adequate drainage is important in managing the somewhat poorly drained and very poorly drained soils.

If adequately drained and protected against erosion, the wet soils in this map unit have fair or good potential for the crops commonly grown in the county. They have good potential for wetland wildlife habitat. The wet soils and the moderately steep or steep soils have poor potential for most urban uses. The well drained and moderately well drained, gently sloping and sloping soils have good potential for most urban uses.

5. Rodman-Moundville-Casco

Excessively drained to moderately well drained, nearly level to very steep soils that have a loamy or sandy subsoil and are underlain by sand or sand and gravel

This map unit is on outwash plains and terraces where the soils formed in sandy and loamy material over outwash deposits. It is in a part of the county known as "Kettle Moraine."

This map unit makes up about 1 percent of the county. It is about 70 percent Rodman soils, 15 percent Moundville soils, 10 percent Casco soils, and 5 percent minor soils.

Rodman soils are on kames and eskers on outwash plains. They are excessively drained and moderately steep to very steep. Typically, the surface layer is very dark grayish brown gravelly sandy loam about 6 inches thick. The subsoil is dark yellowish brown gravelly sandy loam about 7 inches thick. The substratum to a depth of about 60 inches is light yellowish brown and brown, stratified sand and gravel.

Moundville soils are on outwash plains. They are moderately well drained and nearly level and gently sloping. Typically, the surface layer is dark brown loamy sand about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown loamy sand, and the lower part is yellowish brown, mottled sand. The substratum to a depth of about 60 inches is light yellowish brown, mottled sand.

Casco soils are on outwash plains and terraces. They are well drained and somewhat excessively drained and are gently sloping to very steep. Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 15 inches thick. It is yellowish brown and dark brown sandy clay loam in the upper part and brown sandy loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel.

Minor in this map unit are Adrian and Chelsea soils and the Watseka Variant. The very poorly drained Adrian soils are in depressions in stream valleys and in old glacial lake basins. The excessively drained Chelsea soils are on foot slopes in valleys. The somewhat poorly drained Watseka Variant is in old lake basins and on stream terraces.

The major soils in this map unit have poor potential for farming. In general, they are droughty and are shallow to sand and gravel. If cultivated, they are subject to erosion and soil blowing. Planting trees or close growing crops can help to control erosion.

The soils in this map unit have very good potential for recreation uses; large urban areas are nearby. The less sloping major soils have fair potential for residential and urban uses. The minor soils in wet depressions have poor potential for residential and urban uses. Rodman and Casco soils are a good source of sand and gravel. As a result of rapid or very rapid permeability in the substratum, pollution of ground water is a hazard if the major soils are used as sites for waste disposal.

6. Kidder-McHenry-Rotamer

Well drained and moderately well drained, gently sloping to steep soils that have a loamy subsoil and are underlain by gravelly sandy loam

This map unit is mostly on till plains and drumlins where the soils formed in silty and loamy material over sandy loam glacial till. The till plains are broad, and the soils on till plains are mostly gently sloping and sloping (fig. 2).

This map unit makes up about 21 percent of the county. It is about 40 percent Kidder soils, 15 percent McHenry soils, 15 percent Rotamer soils, and 30 percent minor soils.

Kidder soils are on till plains and drumlins. They are well drained and moderately well drained and are gently sloping to moderately steep. Typically, the surface layer is dark grayish brown and brown loam about 11 inches thick. The subsoil is about 20 inches thick. The upper part is dark brown sandy clay loam, and the lower part is dark brown clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam.

McHenry soils are on the middle and upper side slopes on till plains and drumlins. They are well drained and gently sloping or sloping. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is brown silt loam and dark yellowish brown silty clay loam, and the lower part is brown sandy clay loam. The substratum to a depth

of about 60 inches is yellowish brown and light yellowish brown gravelly sandy loam.

Rotamer soils are on the lower side slopes on drumlins and till plains. They are well drained and gently sloping to steep. Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is sandy clay loam about 6 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam.

Minor in this map unit are Kibbie, Matherton, Sebewa, Virgil, Wacousta, and Wauconda soils. The somewhat poorly drained Kibbie soils are in old lake basins and on outwash plains. The somewhat poorly drained Matherton soils are on terraces on outwash plains. The poorly drained and very poorly drained Sebewa soils are in depressions in outwash plains. The somewhat poorly drained Virgil soils are on stream terraces, till plains, and outwash plains. The poorly drained and very poorly drained Wacousta soils are in depressions in old lake basins and in low areas between drumlins. The somewhat poorly drained Wauconda soils are on terraces in old lake basins.

Most areas of the major soils are cultivated and are suited to the crops commonly grown in the county. The commonly grown crops are alfalfa and bromegrass hay, small grain, and corn. Many areas are used for dairy farming. Uncultivated areas remain wooded or are pastured. The major management concerns in cultivated areas are controlling erosion and maintaining tilth. Removal of excess water is needed if cultivated crops are grown on the wet minor soils.

If protected against erosion, the major soils have good potential for growing cultivated crops, such as corn and oats. They have good potential for growing grasses and legumes, such as alfalfa, bromegrass, and red clover. If adequately drained, the wet minor soils have good potential for cultivated crops and clover hay. The major soils that are not too steep have good potential for building sites, septic tank absorption fields, and roadfill. The wet minor soils are so difficult to drain adequately that their potential for urban uses is poor.

7. Whalan-Kidder

Well drained and moderately well drained, gently sloping to moderately steep soils that have a dominantly loamy subsoil and are underlain by dolomite bedrock or gravelly sandy loam

This map unit is mostly on till plains and drumlins and on bedrock-controlled glaciated uplands.

This map unit makes up about 1 percent of the county. It is about 60 percent Whalan soils, 30 percent Kidder soils, and 10 percent minor soils.

Whalan soils are on the side slopes and ridgetops of bedrock-controlled glaciated uplands. They are well drained and gently sloping and sloping. Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is brown loam; the middle part is dark yellowish brown, dark brown, and strong brown clay loam; and the lower part is strong brown clay. Light yellowish brown dolomite is at a depth of about 36 inches.

Kidder soils are on till plains and drumlins. They are well drained and moderately well drained and are gently sloping to moderately steep. Typically, the surface layer is dark grayish brown and brown loam about 11 inches thick. The subsoil is about 20 inches thick. The upper part is dark brown sandy clay loam, and the lower part is dark brown clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam.

Minor in this map unit are Fox, Matherton, Mayville, and McHenry soils. The well drained Fox soils are on outwash plains and terraces. The somewhat poorly drained Matherton soils are on terraces and outwash plains. The gently sloping, moderately well drained Mayville soils are on the broad upper side slopes on ground moraines and drumlins. The well drained McHenry soils are on the upper side slopes on till plains and drumlins.

Most areas of this map unit are used for growing corn, small grain, and hay. Unless slopes are too steep, the soils are suited to the crops commonly grown in the county. Some uncultivated areas are used for timber, and others are used for unimproved pasture. The management concerns in the cultivated areas of the major soils are controlling erosion, maintaining tilth, and conserving soil moisture. The dolomite bedrock in Whalan soils limits the rooting depth of some plants.

The major soils in this map unit have fair or good potential for growing corn, oats, and alfalfa. They have good potential for growing trees. Whalan soils have poor potential for most urban uses because of the underlying dolomite. Kidder soils have good potential for building sites and septic tank absorption fields and poor potential for trench-type sanitary landfills and for sewage lagoons.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. Houghton and Kidder, for example, are the names of two soil series.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Kidder loam, 2 to 6 percent slopes, is one of several phases within the Kidder series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Casco-Rodman complex, 20 to 45 percent slopes, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits, gravel, is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 3, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Some soil descriptions on the following pages contain statements about potentials or means of overcoming soil limitations for waste disposal. Some of the methods described are controlled by local or state ordinances, which should be referred to before construction.

Ad—Adrian muck. This nearly level, very poorly drained soil is in stream valleys and depressions in old glacial lake basins. It is subject to frequent flooding. Slopes are plane. Individual areas are long and range from 5 to 300 acres in size.

Typically, the surface layer is black muck about 34 inches thick. The substratum to a depth of about 60 inches is grayish brown medium sand. It is banded with a few thin layers of sandy loam or loam in some areas.

Included with this soil in mapping are the Watseka Variant and Houghton soils. Included soils make up 10 to 20 percent of the unit. The somewhat poorly drained Watseka Variant is sandy throughout and is higher on the landscape than the Adrian soil. The very poorly drained Houghton soils are deeper over mineral material than the Adrian soil.

Water and air move through this soil at a moderately rapid rate. Surface runoff is slow or ponded. Available water capacity is very high. Organic-matter content is very high, and natural fertility is low. The seasonal high water table is at the surface or within a depth of 1 foot.

Some areas have been drained and farmed, and some remain in sedges and cattails. If adequately drained, this soil has fair potential for growing cultivated crops, hay and pasture plants, and trees. It has poor potential for most engineering uses.

If adequately drained, this soil is moderately well suited to growing corn and soybeans and to grasses and legumes for hay and pasture. Deep ditches can provide adequate drainage if suitable outlets are available. Tile drains placed in the sand substratum should be shielded from the sand by fiberglass blankets. Water-control structures and windbreaks help to prevent excessive oxidation and subsidence of the organic layer and control soil blowing. Shallow ponds improve wildlife habitat in undrained areas. Soil testing for fertilizer requirements is important in managing this soil properly. A possible short supply of macronutrients and micronutrients can severely limit crop yields.

If this soil is overgrazed or grazed when too wet, the pasture can be destroyed under the hoofs of the animals. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Wetness and a seasonal high water table during the tree-planting season limit reforestation to natural regeneration. Harvesting with heavy equipment is restricted to periods when the ground is frozen. Harvesting should be done by clear-cut or area-selection methods to avoid serious windthrow of the remaining trees. Brush that competes with natural regeneration can be controlled by suitable herbicides or mechanically removed.

This soil is poorly suited to building site development and onsite waste disposal because of the poor engineering qualities of the organic material, the flooding, and the seasonal high water table. Capability subclass IVw; woodland suitability subclass 3w.

AzA—Aztalan fine sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on terraces in old lake basins. It is subject to flooding. Slopes are convex or concave. Individual areas are long and range from 3 to 60 acres in size.

Typically, the surface layer is very dark gray fine sandy loam about 10 inches thick. The subsoil is about 19 inches thick. The upper part is dark brown fine sandy loam and brown, mottled sandy loam; the middle part is yellowish brown, mottled sandy clay loam; and the lower part is dark brown, mottled silty clay. The substratum to a depth of about 60 inches is light gray and pinkish gray, mottled silty clay loam. In some areas the surface layer is silt loam or loam. In a few places the upper 36 to 48 inches is loamy.

Included with this soil in mapping are Hebron soils and the Sebewa soil that has a clayey substratum. These soils make up 5 to 15 percent of the unit. The well drained and moderately well drained Hebron soils are above areas of this Aztalan soil. They have a seasonal high water table at a depth of 3 feet or more. The poorly drained and very poorly drained Sebewa soil is below areas of this soil.

Water and air move through this Aztalan soil at a moderately slow rate. Surface runoff is slow, and water ponds in small pockets for short periods after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed, and some are in woodland. If artificially drained, this soil has good potential for growing cultivated crops and for pasture and very good potential for hay. It has poor potential for growing trees and for most engineering uses.

This soil is well suited to growing corn and small grain and to grasses for hay and pasture. Diversions that intercept runoff from nearby higher lying slopes, randomly spaced tile drains, and surface drains improve drainage and crop production. Minimum tillage and winter cover crops help to prevent excessive soil blowing. Returning crop residue to the soil or regularly adding other organic material improves tilth, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to the production of wood. Trees grow slowly and have poor form. Soil-related forest management problems are minor.

As a result of the seasonal high water table, flooding, low strength, and moderately slow permeability, this soil is poorly suited to building site development and onsite waste disposal. The suitability for these uses can be improved. The seasonal high water table can be lowered by tile drains. The flood hazard can be reduced by diking and by straightening stream channels. The low strength can be improved by replacing base material with proper fill. The moderately slow permeability below septic tank absorption fields can be improved by building a larger absorption field. Also, the suitability can be improved by building a filtering mound of suitable material. Capability subclass IIw; woodland suitability subclass 4o.

BaA—Barry silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, poorly drained soil is in depressions in till plains. It is subject to flooding. Slopes are plane. Individual areas are long and range from 5 to 100 acres in size.

Typically, the surface layer is black silt loam about 11 inches thick. The subsurface layer is very dark gray silt loam about 4 inches thick. The subsoil is about 16 inches thick. It is dark grayish brown, firm, mottled loam in the upper part; grayish brown, firm, mottled sandy clay loam in the middle part; and grayish brown, mottled sandy loam in the lower part. The substratum to a depth of about 60 inches is light brownish gray, mottled sandy loam. In some areas the surface layer is loam, and in others it is markedly gray. In some areas free lime is throughout the solum.

Included with this soil in mapping are small areas of Lamartine, Keowns, Houghton, Palms, and Wacousta soils. These soils make up 15 percent of the unit. The Lamartine soils are similar to this Barry soil, but they are somewhat poorly drained and have a thicker silty mantle. The poorly drained Keowns soils are more stratified in the subsoil and substratum than the Barry soil. The very poorly drained Houghton and Palms soils formed in organic material. The poorly drained and very poorly drained Wacousta soils are silty in the subsoil.

Water and air move through this soil at a moderate rate. Surface runoff is slow, and water ponds in depressions during and after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at the surface or within a depth of 1 foot.

Most areas are farmed, and some are in woodland or wet meadows. If drained, this soil has good potential for cultivated crops, hay, and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, a combination of open ditch and tile drainage effectively lowers the water table. Using timely tillage, returning crop residue to the soil or regularly adding other organic material, and occasionally plowing under a green manure crop help to maintain tilth and fertility and increase the infiltration rate.

Overgrazing or grazing when the soil is too wet causes surface compaction, ponding, and puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. In areas where natural regeneration is unreliable, planting by hand or machine on prepared ridges is needed because the soil is wet. Large, vigorous nursery stock is essential to avoid seedling mortality. Harvesting is frequently limited to periods when the ground is frozen. Harvesting by clear-cut or group-selection methods reduces the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal control competing vegetation and thus permit natural regeneration. Capability subclass IIw; woodland suitability subclass 4w.

BoC—Boyer loamy sand, 6 to 12 percent slopes. This sloping, well drained soil is on outwash plains. Slopes are plane or convex. Individual areas are long or irregular in shape and range from 2 to 25 acres in size.

Typically, the surface layer is brown loamy sand about 9 inches thick. The subsoil is about 20 inches thick. The upper part is dark brown, friable loamy sand and sandy loam; the middle part is dark brown and strong brown, firm sandy clay loam and friable sandy loam; and the lower part is dark brown, friable sandy loam. The substratum to a depth of about 60 inches is very pale brown, stratified sand and gravel. In some small areas the surface layer is sandy loam, and in some areas the depth to sand and gravel is less than 20 inches.

Included with this soil in mapping are small areas of Casco, Fox, and Rodman soils. These soils make up 2 to 15 percent of the unit. The well drained and somewhat excessively drained Casco soils contain more clay in the subsoil and are more shallow to the substratum than this Boyer soil. The well drained Fox soils also contain more clay in the subsoil, and the excessively drained Rodman soils are more shallow to the substratum.

Water and air move through the subsoil of this soil at a moderately rapid rate and through the substratum at a very rapid rate. Surface runoff is rapid. Available water capacity is low. Organic-matter content is moderately low, and natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The roots of many crops are restricted by the sand and gravel at a depth of about 29 inches.

Most areas are used for growing small grain, hay, pasture grasses, and trees and for special plants for wildlife habitat. A small acreage is used for growing corn. This soil has fair potential for growing cultivated crops, for hay and pasture, for growing trees, and for most engineering uses.

This soil is moderately well suited to growing corn and small grain and to growing grasses and legumes for hay and pasture and special plants for wildlife habitat. Drought and soil blowing are hazards. Management that conserves moisture, controls soil blowing and water erosion, and raises the level of fertility is needed. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. Substantially reduced seeding rates also conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility. Windbreaks and wind stripcropping help to control soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest. This competition can interfere with natural regeneration. It can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development and onsite waste disposal because it is sloping. Also, contamination of ground water is a hazard because permeability is very rapid in the substratum. Land shaping makes slopes more manageable. Capability subclass IIIe; woodland suitability subclass 3o.

BpB—Boyer sandy loam, 1 to 6 percent slopes. This nearly level and gently sloping, well drained soil is on outwash plains. Slopes are slightly convex or plane. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown sandy loam about 6 inches thick. The subsoil is about 17 inches thick. The upper part is dark brown, friable sandy loam; the middle part is dark brown, firm sandy clay loam; and the lower part is strong brown and dark brown, friable sandy loam. The substratum to a depth of about 60 inches is pale brown, stratified sand and gravel. In some small areas the surface layer is loamy sand.

Included with this soil in mapping are small areas of Chelsea and Rodman soils. These soils make up 2 to 15 percent of the unit. The excessively drained Chelsea soils are more sandy in the subsoil than this Boyer soil. The excessively drained Rodman soils are more gravelly and are shallower to the substratum than the Boyer soil. Also included are some small areas where this Boyer soil has a seasonal high water table at a depth of 3 to 6 feet.

Water and air move through the subsoil of this soil at a moderately rapid rate and through the substratum at a very rapid rate. Surface runoff is slow. Available water capacity is low. Organic-matter content is moderately low, and natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The roots of many crops are restricted by the sand and gravel below a depth of about 32 inches.

Most areas are used for growing small grain, hay, pasture grasses, and trees and for special plants for wildlife habitat. A small acreage is used for growing corn. This soil has fair potential for growing cultivated crops and good potential for hay and pasture. It has fair potential for growing trees and good potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain. If supplemental irrigation water is applied and erosion is controlled, it is well suited to growing row crops year after year. It is moderately well suited to growing grasses and legumes for hay and

pasture and special plants for wildlife habitat. Drought and soil blowing are severe hazards. Management that conserves moisture, controls soil blowing and water erosion, and raises the level of fertility is needed. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. Substantially reduced seeding rates also conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility. Windbreaks and wind stripcropping help to control soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest. This competition can interfere with natural regeneration. It can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is well suited to building site development. It is poorly suited to onsite waste disposal because permeability is very rapid in the substratum. This limitation can be overcome by sealing the bottom and sides of the lagoon or landfill site. The soil is well suited to septic tank absorption fields, but contamination of ground water is a hazard because of the very rapid permeability in the substratum. Capability subclass IIIs; woodland suitability subclass 3o.

CaB2—Casco loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained and somewhat excessively drained soil is on outwash plains and terraces. Slopes are plane or slightly convex. Individual areas are long or irregular in shape and range from 2 to 90 acres in size.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is about 16 inches thick. The upper part is yellowish brown, friable sandy clay loam; the middle part is dark brown, firm sandy clay loam; and the lower part is brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In severely eroded areas the surface layer is gravelly sandy clay loam. In some small areas it is sandy loam.

Included with this soil in mapping are small areas of Boyer, Fox, and Matherton soils. The well drained Boyer soils contain less clay in the subsoil and are deeper to the substratum than this Casco soil. The well drained Fox soils are deeper to the substratum than the Casco soil. The Matherton soils are somewhat poorly drained. The Boyer and Fox soils are near the Casco soil, and the Matherton soils are below the Casco soil on the landscape.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a very rapid rate. Surface runoff is medium. Available water capacity is low. Organic-matter content is moderate, and natural fertility is low. The roots of many crops are restricted by the sand and gravel below a depth of about 22 inches.

Some areas are farmed, and some are used as woodland or wildlife habitat. This soil has fair potential for growing cultivated crops, for hay and pasture, for growing trees, and for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and to growing grasses and legumes for hay and pasture. Drought is a severe hazard and water erosion a moderate hazard. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material improve tilth, fertility, and the rate of water infiltration and reduce crusting. Substantially reduced seeding rates for cultivated crops conserve moisture and help to insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poorer tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. Competing vegetation, which can interfere with natural regeneration following harvest, can be controlled by suitable herbicides or mechanical removal.

This soil is well suited to building site development. It is poorly suited to onsite waste disposal because permeability is very rapid below a depth of 22 inches. This limitation can be overcome by sealing the bottom and sides of the excavations. This soil is well suited to septic tank absorption fields, but contamination of ground water is a hazard because of the very rapid permeability. Capability subclass IIIe; woodland suitability subclass 3s.

CaC2—Casco loam, 6 to 12 percent slopes, eroded. This sloping, well drained and somewhat excessively drained soil is on side slopes of terraces on outwash plains. Slopes are convex. Individual areas are long or irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 15 inches thick. The upper part is yellowish brown, friable sandy clay loam; the middle part is dark brown, firm sandy clay loam; and the lower part is brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In severely eroded areas the surface layer is gravelly sandy clay loam. In some small areas it is sandy loam.

Included with this soil in mapping are small areas of Boyer, Fox, and Rodman soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils contain less clay in the subsoil and are deeper to the substratum than this Casco soil. The well drained Fox soils are also deeper to the substratum, and the excessively drained Rodman soils contain less clay in the subsoil. Boyer, Fox, and Rodman soils are near Casco soils on the landscape.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a very

rapid rate. Surface runoff is rapid. Available water capacity is low. Organic-matter content is moderate, and natural fertility is low. The roots of many crops are restricted by the sand and gravel below a depth of 20 inches.

Some areas are farmed, and some are used as woodland or wildlife habitat. This soil has poor potential for growing cultivated crops and fair potential for hay and pasture, for growing trees, and for most engineering uses.

This soil is poorly suited to growing corn, soybeans, and small grain and moderately well suited to growing grasses and legumes for hay and pasture. The hazards of drought and erosion are severe. Minimum tillage, contour stripcropping, and grassed waterways help to control further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material improve tilth, fertility, and the rate of water infiltration and reduce crusting. Substantially reduced seeding rates for cultivated crops also conserve moisture and help to insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poorer tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Erosion can be controlled and the use of equipment simplified by planting trees on the contour and by careful location of skid roads during harvest. Careful planting of vigorous nursery stock helps to insure survival of planted trees. Vegetation that competes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil is moderately well suited as a building site. The slope and the frost action in the subsoil can be overcome by careful design. The soil is poorly suited to onsite waste disposal. It is also poorly suited to sewage lagoons and sanitary landfills because permeability is very rapid in the substratum. Sealing the bottom and sides of these structures helps to overcome this limitation. This soil is well suited as a septic tank absorption field, but the effluent can contaminate ground water. Capability subclass IVe; woodland suitability subclass 3s.

CrD2—Casco-Rodman complex, 12 to 20 percent slopes, eroded. This map unit consists of well drained, somewhat excessively drained, and excessively drained, moderately steep soils on the sides of kames and eskers on outwash plains. It is about 65 percent Casco soils and 25 percent Rodman soils. The two soils are so intricately mixed or are in areas so small that it is not practical to separate them in mapping. Slopes are convex. Individual areas are long and narrow or irregular in shape and range from 10 to 350 acres in size.

Typically, the Casco soil has a dark grayish brown loam surface layer about 5 inches thick. The subsoil is about 13 inches thick. The upper part is yellowish brown, friable sandy clay loam; the middle part is dark brown, firm sandy clay loam; and the lower part is brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In severely eroded areas the surface layer is gravelly sandy clay loam. In some areas it is sandy loam.

Typically, the Rodman soil has a very dark grayish brown gravelly sandy loam surface layer about 6 inches thick. The subsoil is dark yellowish brown, very friable gravelly sandy loam about 7 inches thick. The substratum to a depth of about 60 inches is light yellowish brown and brown, stratified sand and gravel. In some areas the subsoil is thinner than 7 inches. In severely eroded areas the surface layer is gravelly loamy sand.

Included with these soils in mapping are small areas of Boyer and Chelsea soils. These included soils make up about 10 percent of the unit. The well drained Boyer soils contain less clay in the subsoil than the Casco soil and more clay in the subsoil than the Rodman soil. The excessively drained Chelsea soils contain more sand in the subsoil than the Casco soil and less gravel in the subsoil than the Rodman soil. Both of the included soils are near the Casco and Rodman soils on the landscape.

Water and air move through the subsoil of the Casco soil at a moderate rate and through the substratum at a very rapid rate. They move through the Rodman soil at a very rapid rate. Surface runoff is rapid. Available water capacity is low in the Casco soil and very low in the Rodman soil. Organic-matter content is moderate in the Casco soil and moderately low in the Rodman soil. Natural fertility is low in both soils. The roots of many plants are restricted by the sand and gravel below a depth of 13 to 18 inches.

Most areas are used for growing hay, pasture grasses, or trees or as wildlife habitat. These soils have poor potential for growing cultivated crops and fair to poor potential for hay and pasture. They have fair potential for growing trees and poor potential for most engineering uses.

These soils are suited to growing grasses and legumes for hay and pasture. Droughtiness and a severe erosion hazard are the major management problems. The major management requirements are maintaining a plant cover and controlling erosion. Other requirements are conservation of moisture and improvement of fertility and organic-matter content. Controlled grazing is needed on all pastureland to maintain a good sod cover.

These soils are poorly suited to woodland. Tree growth is slow, and the trees tend to have poor form. The erosion hazard can be reduced by planting on the contour and by careful location of skid roads. Poor survival of planted trees during dry periods can be offset by careful planting of vigorous nursery stock. Although the production of wood on these soils is limited, the trees can be very effective in controlling soil blowing and water erosion.

These soils are poorly suited to building site development because of the slope. They are poorly suited to onsite waste disposal because of the slope and the very rapid permeability in the substratum. Also, the effluent from filter fields can contaminate ground water because

of the very rapid permeability. Some areas can be regraded to reduce the slope to an acceptable grade. Capability subclass VIs; Casco part in woodland suitability subclass 3s, Rodman part in woodland suitability subclass 4f.

CrE—Casco-Rodman complex, 20 to 45 percent slopes. This map unit consists of well drained, somewhat excessively drained, and excessively drained, steep and very steep soils on the sides of kames and eskers on outwash plains. It is about 55 percent Casco soils and 35 percent Rodman soils. The two soils are so intricately mixed or are in areas so small that it is not practical to separate them in mapping. Slopes are convex. Individual areas are long and narrow or irregular in shape and range from 10 to 700 acres in size.

Typically, the Casco soil has a dark grayish brown loam surface layer about 4 inches thick. The subsoil is about 11 inches thick. The upper part is yellowish brown, friable sandy clay loam; the middle part is dark brown, firm sandy clay loam; and the lower part is brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In severely eroded areas the surface layer is gravelly sandy clay loam. In some areas it is sandy loam.

Typically, the Rodman soil has a very dark grayish brown gravelly sandy loam surface layer about 6 inches thick. The subsoil is dark yellowish brown, very friable gravelly sandy loam about 7 inches thick. The substratum to a depth of about 60 inches is light yellowish brown and brown, stratified sand and gravel. In some areas the subsoil is thinner than 7 inches. In severely eroded areas the surface layer is gravelly sand.

Included with these soils in mapping are small areas of Boyer and Chelsea soils. These included soils make up about 10 percent of the unit. The well drained Boyer soils contain less clay in the subsoil than the Casco soil and more clay in the subsoil than the Rodman soil. The excessively drained Chelsea soils contain more sand in the subsoil than the Casco soil and less gravel in the subsoil than the Rodman soil. Both of the included soils are near the Casco and Rodman soils on the landscape.

Water and air move through the subsoil of the Casco soil at a moderate rate and through the substratum at a very rapid rate. They move through the Rodman soil at a very rapid rate. Surface runoff is rapid. Available water capacity is low in the Casco soil and very low in the Rodman soil. Organic-matter content is moderate in the Casco soil and moderately low in the Rodman soil. Natural fertility is low in both soils. Roots are restricted by the sand and gravel below a depth of 13 to 15 inches.

Most areas are used for growing pasture grasses or trees or as wildlife habitat. These soils have poor potential for growing cultivated crops and fair potential for hay and pasture and for growing trees. They have poor potential for most engineering uses.

These soils are suited to growing grasses and legumes for pasture. Droughtiness and a severe erosion hazard are the major management problems. Other management problems are conservation of moisture and improvement of fertility and organic-matter content. In places diversions that intercept runoff from nearby higher lying slopes help to control further erosion. Applications of barnyard manure, lime, and fertilizer improve fertility and tilth. Controlled grazing on pastureland helps to maintain a good sod cover.

These soils are poorly suited to woodland. Tree growth is slow, and the trees tend to have poor form. The erosion hazard can be reduced and the use of equipment simplified by planting on the contour and by careful location of skid roads. Poor survival of planted trees during dry periods can be offset by careful planting of vigorous nursery stock. Although the production of wood on these soils is limited, the trees can be very effective in controlling soil blowing and water erosion.

These soils are poorly suited to building site development because of the slope. They are poorly suited to onsite waste disposal because of the slope and the very rapid permeability in the substratum. Also, the effluent from septic tank absorption fields can contaminate ground water because of the very rapid permeability. Regrading helps to reduce the slope. Capability subclass VIIs; Casco part in woodland suitability subclass 3s, Rodman part in woodland suitability subclass 4f.

CtB—Chelsea loamy fine sand, 1 to 6 percent slopes. This nearly level and gently sloping, excessively drained soil is on the foot slopes of kames and on pitted outwash plains. Slopes are simple or complex and are convex. Individual areas are long and irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is brown loamy fine sand about 11 inches thick. The next layer is dark yellowish brown sand about 11 inches thick. Below this to a depth of about 60 inches is light yellowish brown fine sand that has bands of brown loamy fine sand and sandy loam 1/2 inch to 2 inches thick.

Included with this soil in mapping are small areas of Boyer, Casco, Fox, and Lorenzo soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils, the well drained and somewhat excessively drained Casco soils, the well drained Fox soils, and the Lorenzo soils contain more clay in the subsoil than this Chelsea soil. Also, the Lorenzo soils have a darker surface layer. All of these included soils generally are above the Chelsea soil on the landscape. Also included are some small areas where the Chelsea soil has a seasonal high water table at a depth of 3 to 5 feet.

Water and air move through this soil at a rapid rate. Surface runoff is slow. Available water capacity is low. Organic-matter content is moderately low, and natural fertility is low. The surface layer is very friable and can be easily tilled. For many crops, the growth of roots is restricted by the low available water capacity.

Most areas are used for growing small grain, hay, pasture grasses, and trees. A small acreage is used for growing corn. This soil has poor potential for growing cultivated crops; fair potential for growing hay, pasture

grasses, and trees; and good potential for most engineering uses.

This soil is poorly suited to growing corn, soybeans, and small grain. If supplemental irrigation water is applied and erosion is controlled, the soil is suited to growing row crops year after year. It is moderately well suited to growing grasses and legumes for hay and pasture and special plants for wildlife habitat. The hazards of drought and soil blowing are severe. Management that conserves moisture, controls soil blowing and water erosion, and raises the level of fertility is needed. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. Substantially reduced seeding rates also conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility. Windbreaks and wind stripcropping help to control soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. Competing vegetation, which can interfere with natural regeneration following harvest, can be controlled by suitable herbicides or by mechanical removal.

This soil is well suited to building site development. It is poorly suited to onsite waste disposal because of the rapid permeability. It is well suited to septic tank absorption fields, but the effluent can contaminate ground water because of the rapid permeability. Capability subclass IVs; woodland suitability subclass 3s.

CtC—Chelsea loamy fine sand, 6 to 20 percent slopes. This sloping and moderately steep, excessively drained soil is on the foot slopes of kames and on pitted outwash plains. Slopes are simple or complex and plane or concave. Individual areas are long and narrow and range from 3 to 100 acres in size.

Typically, the surface layer is brown loamy fine sand about 6 inches thick. The next layer is dark yellowish brown sand about 8 inches thick. Below this to a depth of about 60 inches is very pale brown sand that has brown loamy sand bands 1/2 inch to 2 inches thick.

Included with this soil in mapping are small areas of Boyer and Casco soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils and the well drained and somewhat excessively drained Casco soils contain more clay in the subsoil than this Chelsea soil and formed in outwash sand and gravel. They are generally above Chelsea soils on the landscape.

Water and air move through this soil at a rapid rate. Surface runoff is medium. Available water capacity is low. Organic-matter content is moderately low, and natural fertility is low. The surface layer is very friable. The low available water capacity restricts root growth for many crops.

Many areas are used for wildlife habitat or for growing trees. Some are used for growing small grain, hay, or pasture grasses. This soil has poor potential for growing cultivated crops and fair potential for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

This soil is suited to growing grasses and legumes for hay and pasture. It is moderately well suited to some special plantings for wildlife habitat. Drought and soil blowing are severe hazards. Also, erosion is a hazard. Management that conserves moisture, controls soil blowing and water erosion, and raises the level of fertility is needed. Minimum tillage and winter cover crops help to prevent excessive soil blowing and water erosion and conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility. Windbreaks and wind stripcropping help to control soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suitable for the production of wood. Erosion can be controlled and the use of equipment simplified by planting trees on the contour and by careful location of skid roads during harvest. Careful planting of vigorous nursery stock helps to insure the survival of planted trees. Vegetation that competes with natural regeneration following harvest can be controlled by suitable herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of the rapid permeability and the slope. It is poorly suited to septic tank absorption fields because of the slope. Also, the effluent can contaminate ground water because of the rapid permeability. Slopes can be reshaped to a more manageable grade. Capability subclass VIs; woodland suitability subclass 3s.

DcA—Del Rey silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is in old lake basins. Slopes are plane or concave. Individual areas are long and range from 2 to 100 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 16 inches thick. The upper part is grayish brown, mottled silty clay, and the lower part is dark grayish brown and brown silty clay loam. The substratum to a depth of about 60 inches is light gray silty clay loam. In some small areas the surface layer is loam or sandy loam. Some areas are slightly better drained or more poorly drained than this soil.

Included with this soil in mapping are small areas of Milford soils, the Matherton soil that has a clayey substratum, and Saylesville soils. These soils make up 5 to 15 percent of the unit. The poorly drained and very poorly drained Milford soils are below areas of this Del Rey soil and have a seasonal high water table at the surface or as deep as 1 foot. The somewhat poorly drained Matherton soil is adjacent to this soil and has a thick layer of loamy overburden. The moderately well drained Saylesville soils are higher on the landscape than this soil and have a water table below a depth of 3 feet.

Water and air move through this soil at a slow rate. Surface runoff is slow, and water concentrates in small

depressions for short periods after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. Some are in pasture, and a small acreage is idle. This soil has good potential for growing cultivated crops and for hay and pasture if drained. It has good potential for growing trees and poor potential for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Because the subsoil is slowly permeable, tile drains should be placed at close intervals and as shallow as design permits. Minimum tillage, timeliness of tillage, and regular additions of crop residue or other organic matter help to maintain tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by suitable herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal. As a result of the seasonal high water table, the low strength, and the slow permeability in the subsoil and substratum, this soil is difficult to improve for most uses. Homes or buildings should be specially designed so that footings are of adequate size and depth. Artificial drainage helps to lower the water table and prevents flooding of basements or the lower story. Capability subclass IIw; woodland suitability subclass 2c.

DdB—Dodge silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on till plains, moraines, and drumlins. Slopes are plane or convex. Individual areas are long or irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 28 inches thick. The upper part is yellowish brown, friable silt loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is strong brown, firm clay loam. The substratum to a depth of 60 inches is light yellowish brown gravelly sandy loam. Some small areas have a silty mantle that is thicker than 36 inches.

Included with this soil in mapping are small areas of McHenry, St. Charles, and Virgil soils. These soils make up 5 to 15 percent of the unit. The well drained McHenry soils have a thinner silty mantle and the moderately well drained St. Charles soils a thicker silty mantle than this soil. The somewhat poorly drained Virgil soils also have a thicker silty mantle and are less well drained. McHenry and St. Charles soils and the Dodge soil occupy similar positions on the landscape. Virgil soils occupy positions below the Dodge soil. Also included are some small areas of the moderately well drained Mayville soils. These soils are similar to the Dodge soil but have a seasonal high water table at a depth of 3 to 5 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is high. The surface layer is friable and is best tilled when moist.

Most areas are farmed. Some are used as woodland or wildlife habitat. This soil has good potential for growing cultivated crops and trees and for hay and pasture. It has fair potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terraces, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. Returning crop residue to the soil and minimizing tillage improve fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil can produce salable wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or mechanical removal of the brush.

This soil is moderately well suited to building site development because of low strength in the subsoil. This limitation can be overcome by special care in the design and placement of footings. This soil is well suited to onsite waste disposal. Capability subclass IIe; woodland suitability subclass 2o.

Ed—Edwards muck. This nearly level, very poorly drained soil is in depressions in old lake basins. It is subject to frequent flooding. Slopes are plane or slightly concave. Individual areas are semiround and range from 10 to 350 acres in size.

Typically, the surface layer is black muck about 21 inches thick. The next layer is grayish brown and light brownish gray marl about 25 inches thick. Below the marl to a depth of 60 inches is gray and light olive brown sand.

Included with this soil in mapping are the Watseka Variant and Adrian and Houghton soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Watseka Variant is sandy throughout. It is above areas of the Edwards soil. The very poorly drained Adrian soils are next to the Edward soil on the landscape. They lack a marl layer between the muck and the sand. The very poorly drained Houghton soils have a thicker organic layer than this Edwards soil.

Water and air move through the organic layers at a moderately rapid rate and through the marl at a slow rate. Surface runoff is slow, and water ponds in depressions. Available water capacity is moderate. Organic-

matter content is very high, and natural fertility is low. The seasonal high water table is at the surface or within a depth of 1 foot.

Most areas are farmed. If adequately drained, this soil has fair potential for growing cultivated crops, hay, and pasture grasses. It has fair potential for growing trees and poor potential for most engineering uses.

If adequately drained, this soil is suited to growing row crops, soybeans, and small grain and moderately well suited to growing hay and pasture grasses. Properly designed and constructed ditches can supply adequate drainage if outlets are available. Water-control structures help to prevent excessive oxidation of the organic layer. Minimum tillage, windbreaks, and winter cover crops help to prevent excessive soil blowing. Special sampling and testing of this soil for micronutrients and macronutrients is needed. Some micronutrients tend to be in short supply; unless the deficiency is properly offset, a serious reduction in crop yields can result. The mildly alkaline reaction of the underlying marl can cause deficiencies of phosphorus.

If pasture is overgrazed or grazed when the soil is too wet, the sod is trampled and destroyed. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the sod in good condition.

This soil is suitable for the production of wood. Wetness and a high water table during the tree-planting season limit reforestation to natural regeneration. Harvesting with heavy equipment is confined to periods when the ground is frozen. It should be done by clear-cut or area-selection methods to avoid serious windthrow of the remaining trees. Brushy species competing with natural regeneration can be controlled by suitable herbicides or mechanically removed.

This soil is poorly suited to all engineering uses. As a result of the seasonal high water table, the flooding, the low strength of the muck, and the moderate depth to sand, most management measures are difficult to apply. Capability subclass IVw; woodland suitability subclass 3w.

Ev—Elvers silt loam. This nearly level, very poorly drained soil is on flood plains and stream bottoms. It is subject to frequent flooding. Individual areas are semiround or long and range from 3 to 10 acres in size. Slopes are slightly concave.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The substratum is grayish brown silt loam about 12 inches thick. The underlying organic material to a depth of about 60 inches is black muck. In some places the surface layer is loam or sandy loam. In others the silty alluvium is less than 16 inches thick.

Included with this soil in mapping are Palms, Houghton, and Radford soils. These soils make up 5 to 15 percent of the unit. The very poorly drained Palms and Houghton soils are in areas where the silty overburden is less than 16 inches thick. The somewhat poorly drained Radford soils are above areas of this Elvers soil.

Water and air move through this soil at a moderate rate, but they have difficulty passing the boundary between the silty alluvium and the organic material probably as a result of extreme differences in pore size. Available water capacity is very high. Organic-matter content and natural fertility are high. The seasonal high water table is at the surface or within a depth of 1 foot.

Most areas are farmed. Some are idle. If adequately drained, this soil has very good potential for growing cultivated crops and hay and pasture grasses. It has fair potential for growing trees and poor potential for all engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to growing grasses for hay and pasture. Ditches and waterways that control flooding and lower the water table are needed if cultivated crops are grown. Tile drains placed in the organic material also help to lower the water table. Diversions that intercept runoff from higher lying adjacent slopes can provide protection against flooding. Waterways channel water safely into the drainage ditches. Return of crop residue to the soil or regular additions of other organic material and timeliness of tillage are important because tilth is easily destroyed.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. In areas where natural regeneration is unreliable, planting by hand or machine on prepared ridges is needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Harvesting by clear-cut or group-selection methods reduces the danger of windthrow of the remaining trees. Control of competing vegetation by suitable herbicides or mechanical removal permits natural regeneration.

This soil is poorly suited to all engineering uses because of the low strength and the frequent flooding. The organic material is not suitable for engineering purposes. The restrictive features are very difficult to overcome. Capability subclass IIw; woodland suitability subclass 4w.

Fn—Fluvaquents. These nearly level, poorly drained and very poorly drained soils are on flood plains that are dissected by watercourses. They are subject to frequent flooding. Slopes are mostly plane. Individual areas are long and narrow and range from 10 to 110 acres in size.

These soils consist of a mixture of soil material that was deposited as floodwater receded. The material is of mixed origin, ranging from sand to silt loam and having thin layers of organic material throughout. Because the range of profile characteristics is wide, the soils cannot be classified at the series level. The soil material has not been affected by soil-forming processes because of recent and recurring depositions by floodwater.

Included with these soils in mapping are small areas of Otter and Houghton soils. These included soils make up 5 to 15 percent of the unit. The poorly drained Otter soils are slightly higher on the landscape than the Fluvaquents. They are silty throughout. The very poorly drained Houghton soils are slightly lower on the landscape in depressions. They are organic throughout. Also included are well drained or moderately well drained Fluvaquents and areas where the soil is sandy to a depth of 60 inches.

Permeability, organic-matter content, and natural fertility vary. Available water capacity ranges from moderate to very high. Surface runoff is slow. The shrink-swell potential is moderate or low. The roots of plants are restricted because the bands of soil in the profile vary in texture and because the soils are saturated to within a depth of 1 foot during wet periods.

Most areas are used for pasture or woodland. These soils have poor potential for growing cultivated crops, hay, and trees and for most engineering uses.

These soils are poorly suited to growing corn and small grain and to grasses and legumes for hay unless they are drained and protected against flooding. If the sod cover is removed, erosion caused by floodwater can occur.

Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture plants in good condition.

These soils are not naturally forested and therefore are not generally managed for woodland.

These soils are well suited to growing wetland plants for wildlife. They are generally best used in their natural condition, but planting shrubs can provide extra cover for wildlife.

These soils are poorly suited to building site development and onsite waste disposal because of the flood hazard and the seasonal high water table. Capability subclass Vw; not assigned to a woodland suitability subclass.

FoC2—Fox loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on the lower side slopes of terraces and outwash plains. Slopes are convex. Individual areas are long and narrow and range from 4 to 45 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 18 inches thick. The upper part is dark yellowish brown, friable loam; the middle part is brown, firm clay loam; and the lower part is brown, firm sandy clay loam. The substratum to a depth of about 60 inches is light yellowish brown, stratified sand and gravel. In some small areas, the soil is severely eroded and the surface layer is clay loam.

Included with this soil in mapping are small areas of Boyer, Casco, and Lorenzo soils. These soils make up 5 to 20 percent of the unit. The well drained Boyer soils contain less clay in the subsoil than this Fox soil. The well drained and somewhat excessively drained Casco soils are shallower over the substratum than the Fox soil. The well drained Lorenzo soils are also shallower over the substratum and have a thicker, darker colored surface layer. Boyer, Casco, and Lorenzo soils are above the Fox soil on the landscape.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a rapid or very rapid rate. Surface runoff is rapid. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is low. The roots of most crops are restricted by the underlying sand and gravel below a depth of 26 inches.

Most areas are farmed. Some are used as woodland or wildlife habitat. This soil has fair potential for growing cultivated crops. It has good potential for growing trees and for hay and pasture and fair potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Drought is a moderate hazard and erosion a severe hazard. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material help to prepare an adequate seedbed by improving tilth, fertility, and water infiltration and by reducing crusting.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poorer tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is moderately well suited to building site development because of the low strength in the subsoil and the slope. It is poorly suited to onsite waste disposal because of the very rapid permeability in the substratum and the slope. The sides and bottom of a lagoon or landfill can be sealed with clayey subsoil material. This soil is moderately well suited as a septic tank absorption field. The slope is a limitation, but it can be overcome by careful design and construction. As a result of the very rapid or rapid permeability in the substratum, the effluent can contaminate ground water. Capability subclass IIIe; woodland suitability subclass 2o.

FsA—Fox silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains. Slopes are slightly convex or plane. Individual areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 23 inches thick. The upper part is dark yellowish brown, friable silt loam and firm silty clay loam; the middle part is brown, firm sandy clay loam; and the lower part is brown, firm

sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown and light yellowish brown, stratified sand and gravel. In places, the subsoil is thicker and the depth to sand and gravel is more than 40 inches. In some small areas the surface layer is loam or sandy loam, and in others the silty mantle is 24 to 36 inches thick.

Included with this soil in mapping are small areas of Boyer, Casco, and Matherton soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils contain less clay in the subsoil than this Fox soil. The well drained and somewhat excessively drained Casco soils are shallower over sand and gravel than the Fox soil. The Boyer and Casco soils are near the Fox soil on the landscape. The Matherton soils are somewhat poorly drained and are lower on the landscape than the Fox soil. Also included are some small areas, on foot slopes, where this Fox soil has a seasonal high water table at a depth of 3 to 5 feet.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a rapid or very rapid rate. Runoff is slow. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The roots of many crops are restricted by the sand and gravel below a depth of about 33 inches.

Most areas are farmed. Some are used as woodland or wildlife habitat. This soil has good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Drought is a moderate hazard. Minimum tillage and winter cover crops help to conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility, reduces crusting, and increases the rate of water infiltration. or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of low strength in the subsoil. It is poorly suited to onsite waste disposal because permeability in the substratum is very rapid. The suitability can be improved by sealing the sides and bottom of the lagoon or landfill. The soil is well suited as a septic tank absorption field, but the effluent can contaminate ground water because of the rapid or very rapid permeability. Capability subclass IIs; woodland suitability subclass 2o.

FsB—Fox silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on terraces and outwash plains. Slopes are plane or slightly convex. Individual areas are irregular in shape and range from 2 to 175 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is dark yellowish brown, friable silt loam and firm silty clay loam; the middle part is brown, firm clay loam; and the lower part is brown, firm sandy clay loam. The substratum to a depth of about 60 inches is light brown, stratified sand and gravel. In places, the subsoil is thicker and the depth to sand and gravel is more than 40 inches. In some small areas the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of Boyer and Casco soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils contain less clay in the subsoil than this Fox soil. The well drained and somewhat excessively drained Casco soils are shallower over the substratum than the Fox soil. Boyer and Casco soils are near the Fox soil on the landscape. Also included, on foot slopes, are some small areas where the Fox soil has a seasonal high water table at a depth of 3 to 5 feet.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a rapid or very rapid rate. Surface runoff is medium. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range of moisture content. The roots of many crops are restricted by the sand and gravel below a depth of about 30 inches.

Most areas are farmed. Some are used as woodland or wildlife habitat. This soil has fair potential for growing cultivated crops. It has good potential for hay and pasture and for growing trees and fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Drought and erosion are moderate hazards. Minimum tillage, contouring, winter cover crops, and grassed waterways help to conserve moisture and prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of low strength in the subsoil. It is poorly suited to onsite waste disposal because permeability is rapid or very rapid in the substratum. This limitation can be overcome by sealing the bottom of the lagoon or landfill with clayey subsoil material. The soil is well suited as a septic tank absorption field, but the effluent can contaminate ground water. Capability subclass IIe; woodland suitability subclass 2o.

Gd—Gilford sandy loam. This nearly level, very poorly drained soil is in depressions in outwash plains. It is subject to frequent flooding. Slopes are plane. Individual areas are irregular in shape and range from 4 to 50 acres in size.

Typically, the surface layer is black sandy loam about 11 inches thick. The subsoil is mottled sandy loam about 18 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is light brownish gray sand. In some small areas there is a 10- to 20-inch overburden of loamy alluvium.

Included with this soil in mapping are areas of Adrian and Wasepi soils. These soils make up 2 to 15 percent of the unit. The very poorly drained Adrian soils are lower on the landscape than this Gilford soil and have organic material rather than mineral material over the sand. The somewhat poorly drained Wasepi soils are similar to the Gilford soils but are higher on the landscape.

Water and air move through this soil at a moderately rapid rate. Surface runoff is slow. Natural fertility is low, and organic-matter content is high. Available water capacity is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The roots of many crops are restricted by the sand below a depth of about 29 inches. The seasonal high water table is at the surface or within a depth of 1 foot.

Most areas are farmed. Some are used for pasture and hay. A few small areas are used for wildlife habitat. Most areas are undrained. If drained, this soil has good potential for growing cultivated crops and for grasses for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If adequately drained, this soil is suited to growing corn, soybeans, and small grain and to grasses for hay and pasture. The water table can be lowered by open ditch drains. Diversions that intercept runoff or seepage from the slopes above are also beneficial. Perennial plants selected for planting should have some tolerance for wetness. Soil blowing is a hazard if this soil is drained and cultivated. Cover crops, windbreaks, a mulch of crop residue, and minimum tillage are helpful in reducing this hazard. They also help to maintain or improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. In areas where natural regeneration is unreliable, planting by hand or machine on prepared ridges is needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Harvesting by clear-cut or group-selection methods reduces the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus permit natural regeneration.

This soil is poorly suited to most engineering uses. If the soil is used as a building site, construction techniques that lower the water table, elevate the building above the high water mark, and insure placement of footings in the stable soil material below a depth of about 30 inches are needed. Capability subclass IIIw; woodland suitability subclass 4w.

GsB—Grays silt loam, 2 to 6 percent slopes. This gently sloping, well drained and moderately well drained soil is on terraces in old lake basins. Slopes are convex. Individual areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 6 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 29 inches thick. It is yellowish brown silt loam in the upper part; yellowish brown silty clay loam in the middle part; and yellowish brown, mottled silt loam in the lower part. The substratum to a depth of about 60 inches is stratified silt and very fine sand. In some small areas the surface layer is light colored. In some the slope is 0 to 2 percent.

Included with this soil in mapping are Kibbie, Sisson, and Wauconda soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Kibbie soils and the well drained Sisson soils have a loamy subsoil. The somewhat poorly drained Wauconda soils are slightly lower on the landscape than this Grays soil.

Water and air move through this soil at a moderate rate. Surface runoff is moderate. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of more than 3 feet.

Most areas are farmed. This soil has very good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage, broad-base terraces, contour stripcropping, grassed waterways, and diversions help to control erosion. Returning crop residue to the soil and regularly adding other organic material improve tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth.

Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of low strength and a seasonal high water table. Placement of footings in the more stable substratum helps to minimize the low strength. This soil is poorly suited to onsite waste disposal. Because of the seasonal high water table, the soil is difficult to manage. Placing septic tank absorption fields in a filtering mound of suitable material improves the potential. Capability subclass IIe; woodland suitability subclass 1o.

GtB—Grellton fine sandy loam, 2 to 6 percent slopes. This gently sloping, well drained and moderately well drained soil is on till plains. Slopes are convex. Individual areas are oblong and long and narrow and range from 3 to 140 acres in size.

Typically, the surface layer is dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 35 inches thick. It is brown fine sandy loam and dark yellowish brown loam in the upper part; dark yellowish brown and yellowish brown sandy clay loam in the middle part; and yellowish brown, mottled silt loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In some areas the surface layer is loamy sand, sandy loam, or loam and is dark brown or very dark grayish brown. In a few areas the loamy upper part is more than 40 inches thick over silty material.

Included with this soil in mapping are Kibbie, Lamartine, and Theresa soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Kibbie soils are similar to this Grellton soil but are lower on the landscape and have a seasonal high water table at a depth of 1 foot to 2 feet. The somewhat poorly drained Lamartine soils are silty in the upper part, have a seasonal high water table at a depth of 1 foot to 3 feet, and are slightly lower on the landscape than the Grellton soil. The well drained Theresa soils are silty in the upper part and are a little higher on the landscape than the Grellton soil.

Water and air move through this soil at a moderate rate. Surface runoff is moderate. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of more than 3 feet.

Most areas are farmed. This soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has good potential for growing trees and for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. They also help to reduce soil loss by water erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration. Contour tillage, contour stripcropping, terraces, and sod waterways help to control erosion.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

The well drained areas of this soil are well suited to building site development and onsite waste disposal. The moderately well drained areas are mostly poorly suited. Water management is the major problem if the moderately well drained areas are used as building sites or septic tank absorption fields. In most of the moderately well drained areas, the drainage condition is the result of a perched water table. Permeability is on the slow side of moderate. The suitability for septic tank absorption fields is improved if the size of the field is increased. Capability subclass IIe; woodland suitability subclass 1o.

GwB—Griswold sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on the upper side slopes of moraines and till plains. Slopes are convex. Individual areas are semiround and range from 4 to 225 acres in size.

Typically, the surface layer is black and dark brown sandy loam about 12 inches thick. The subsoil is about 13 inches thick. The upper part is dark brown sandy clay loam, and the lower part is dark brown sandy loam. The substratum to a depth of about 60 inches is yellowish brown gravelly sandy loam. In some small areas the surface layer is loam. In a few areas the dark colored surface layer is less than 10 inches thick.

Included with this soil in mapping are some small areas of Kidder and Rotamer soils. These soils make up 2 to 20 percent of the unit. The well drained Kidder soils have a lighter colored surface layer than this Griswold soil. The well drained Rotamer soils are shallower over gravelly sandy loam glacial till than the Griswold soil. Both of the included soils are below areas of the Griswold soil.

Water and air move through this soil at a moderate rate. Surface runoff and available water capacity are moderate. Organic-matter content is high, and natural fertility is medium.

Most areas are farmed. This soil has good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has poor potential for growing trees and good or fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. They also reduce soil loss through water erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration. Contouring, contour stripcropping, terraces, and grassed waterways help to control erosion.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture in good condition.

This soil is not naturally forested and therefore is not generally managed for woodland.

This soil is well suited to building site development. It is moderately well suited to onsite waste disposal. The moderately rapid permeability in the substratum can be reduced by lining the bottom and sides of the trench with the more clayey subsoil material and then compacting the clayey material. This soil is well suited as a septic tank absorption field. Capability subclass IIe; not assigned to a woodland suitability subclass.

GwC2—Griswold sandy loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on the middle side slopes of moraines and till plains. Slopes are convex. Individual areas are long and range from 3 to 45 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsoil is about 15 inches thick. The upper part is dark brown sandy clay loam, and the lower part is dark brown sandy loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In some small areas the surface layer is loam. In others, the surface layer is light colored or depth to the substratum is less than 24 inches.

Included with this soil in mapping are Aztalan, Kidder, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Aztalan soils are lower on the landscape than this Griswold soil and are clayey in the lower part of the subsoil. The somewhat poorly drained Lamartine soils also are lower on the landscape and have a silty mantle. The well drained Rotamer soils are less than 24 inches deep over the gravelly sandy loam till.

Water and air move through this soil at a moderate rate. Surface runoff is rapid. Available water capacity is moderate. Organic-matter content is high, and natural fertility is medium.

Most areas are farmed. This soil has fair potential for growing cultivated crops and good potential for grasses and legumes for hay and pasture. It has poor potential for growing trees and fair potential for most engineering uses.

This soil is suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The erosion hazard is severe. Minimum tillage, contour stripcropping, diversions, terraces, and grassed waterways help to control erosion and conserve moisture. Returning crop residue to the soil and adding other organic material help in preparing an adequate seedbed by improving organic-matter content, tilth, fertility, and the water infiltration rate. Reduced seeding rates for cultivated crops help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture in good condition.

This soil is not naturally forested and therefore is not generally managed for woodland.

This soil is only moderately well suited to building site development because of the slope. Careful site selection and placement of footings in the stable substratum are helpful. Regrading sites to a more gentle slope also is helpful. This soil is moderately well suited as a septic tank absorption field. The slope is a limitation. It can be reduced, however, by proper placement of filter fields and by extra care during construction. Capability subclass IIIe; not assigned to a woodland suitability subclass.

HeB—Hebron loam, 1 to 6 percent slopes. This nearly level and gently sloping, well drained and moderately well drained soil is on terraces in old lake basins. Slopes are convex. Individual areas are round or oval and range from 2 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 28 inches thick. The upper part is dark brown loam; the middle part is dark brown sandy clay loam; and the lower part is dark yellowish brown, mottled silty clay. The substratum to a depth of about 60 inches is light yellowish brown, mottled silt and clay. In places the surface layer is silt loam or sandy loam. In some areas depth to the clayey substratum is less than 18 inches or more than 40 inches.

Included with this soil in mapping are Aztalan soils and the Matherton and Sebewa soils that have a clayey substratum. These soils make up 5 to 20 percent of the unit. The somewhat poorly drained Aztalan soils have a fine sandy loam surface layer that is darker and thicker than that of this Hebron soil. The somewhat poorly drained Matherton soil is below the Hebron soil on the landscape and has a seasonal high water table at a depth of 1 foot to 3 feet. The poorly drained and very poorly drained Sebewa soil also is below the Hebron soil on the landscape and has a seasonal high water table at the surface or within a depth of 1 foot.

Water and air move through this soil at a moderately slow rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of more than 3 feet.

Most areas are farmed. Some are wooded. This soil has very good potential for growing cultivated crops and for grasses and legumes for hay and good potential for pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage, contour stripcropping, diversions, terraces, and grassed waterways help to control erosion and maintain tilth. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

The well drained areas of this soil are only moderately well suited to building site development because of the shrink-swell potential and low strength. These limitations can be minimized by careful design of footings.

The moderately well drained areas are mostly poorly suited as building sites.

This soil is only moderately well suited to onsite waste disposal because of the excessively clayey material below a depth of about 3 feet. This material is excellent seal material. The soil is poorly suited as a septic tank absorption field. The moderately slow permeability and a seasonal high water table at a depth of more than 3 feet in the moderately well drained areas are extremely difficult to overcome. Building oversized systems helps to minimize the effect of moderately slow permeability in areas where the water table is below a depth of 4 feet. Building a filtering mound of suitable material is also helpful. Capability subclass IIe; woodland suitability subclass 2o.

Ht—Houghton muck. This nearly level, very poorly drained, organic soil is in depressions in old lake basins. It is subject to frequent flooding. Slopes are plane. Individual areas are round or oval and range from 3 to more than 2,000 acres in size.

Typically, the organic layer is black, very dark brown, very dark grayish brown, and very dark gray muck about 72 inches thick.

Included with this soil in mapping are Adrian, Keowns, and Palms soils. These soils make up 10 to 20 percent of the unit. The very poorly drained Adrian soils are next to the Houghton soil and are underlain by sand or loamy sand at a depth of 16 to 51 inches. The poorly drained Keowns soils are slightly higher on the landscape than the Houghton soil and are underlain by lake-laid silt and very fine sand. The very poorly drained Palms soils are similar to the Houghton soil, but they are underlain by loamy material at a depth of 16 to 51 inches.

Water and air move through this soil at a moderately rapid rate. Surface runoff is slow or ponded. Available water capacity is very high. Organic-matter content is very high, and natural fertility is low. The seasonal high water table is at the surface or within a depth of 1 foot.

Many areas have been drained and are farmed. Some remain in sedges and cattails. If adequately drained, this soil has very good potential for cultivated crops; good potential for specialty crops, such as mint and certain vegetables (fig. 3); fair potential for grasses and legumes for hay and pasture and for growing trees; and poor potential for most engineering uses.

If adequately drained, this soil is well suited to growing corn, soybeans, and specialty crops. It is moderately well suited to growing small grain and to grasses and legumes for hay and pasture. If adequate outlets are available, tile drains and deep ditches can be used to remove excess water. Water-control structures and windbreaks help to prevent excessive oxidation and subsidence and to control soil blowing. Shallow ponds improve undrained areas for wildlife habitat. Soil testing for fertilizer recommendations is important in managing this soil properly. Macronutrients and micronutrients can be in short supply; if the supply is limited, crop yields are severely limited.

If pasture is overgrazed or grazed when the soil is wet, the sod can be destroyed under the hoofs of the animals. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the sod in good condition.

This soil is suitable for the production of wood. Soil wetness and a high water table during the tree-planting season limit reforestation to natural regeneration. Harvesting with heavy equipment is confined to periods when the ground is frozen. Harvesting should be done by clear-cut or area-selection methods to avoid serious windthrow of the remaining trees. Brushy species competing with natural regeneration can be controlled by suitable herbicides or mechanically removed.

This soil is poorly suited to almost all engineering uses because of low strength and the seasonal high water table. Capability subclass IIIw; woodland suitability subclass 3w.

JuB—Juneau silt loam, 1 to 6 percent slopes. This nearly level and gently sloping, well drained and moderately well drained soil is in stream valleys and drainageways. It is subject to occasional flooding. It formed in recent silty alluvium over a buried silty soil. Individual areas are long and range from 2 to 15 acres in size. Slopes are concave.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The next layer is dark grayish brown silt loam about 18 inches thick. The underlying buried soil extends to a depth of more than 60 inches. The upper part is yellowish brown silt loam, the middle part is yellowish brown silty clay loam, and the lower part is

brown sandy loam. In some areas the surface layer is sandy loam. The silty alluvial overburden is more than 40 inches thick in some places and less than 18 inches thick in others.

Included with this soil in mapping are Kidder, Lamartine, and Radford soils. These soils make up 2 to 10 percent of the unit. The well drained and moderately well drained Kidder soils are above this Juneau soil on the landscape. Radford soils are similar to this Juneau soil but are somewhat poorly drained and have a darker surface layer. The somewhat poorly drained Lamartine soils are below areas of the Juneau soil.

Water and air move through this soil at a moderate rate. Surface runoff is slow, and water running off nearby slopes concentrates on this soil during and after most rains. Available water capacity is very high. Organic-matter content and natural fertility are high. The seasonal high water table is at a depth of more than 3 feet.

Some areas are farmed, and some are in pasture or are idle. This soil has good potential for growing cultivated crops and very good potential for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If adequately protected against flooding, this soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Adequately controlling flooding and channelling the runoff that concentrates on this soil are the major management concerns. Conservation practices on the adjacent higher lying soils reduce the amount of water that flows onto this soil. Diversions that intercept and channel runoff also are helpful. Grassed waterways are essential. Proper design and construction and seeding of grassed waterways help to remove the runoff, control erosion, and reduce both the time and peak of flooding so that it no longer restricts crop growth. Minimum tillage, regular additions of organic material, and contouring also are beneficial.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil can produce salable wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development because of flooding and a seasonal high water table in moderately well drained areas. The suitability can be improved by controlling flooding and by installing a drainage system. This soil is poorly suited to onsite waste disposal because of wetness and flooding. The suitability can be improved by controlling flooding. Also, drainage is needed in areas where the seasonal high water table is at a depth of more than 3 feet. Capability subclass IIe; woodland suitability subclass 2o.

Kb—Keowns silt loam. This nearly level, poorly drained soil is in old lake basins. It is subject to frequent flooding. Slopes are slightly concave or plane. Individual areas are irregular in shape and range from 4 to 150 acres in size.

Typically, the surface layer is black silt loam about 7 inches thick. The subsurface layer is very dark gray fine sandy loam about 3 inches thick. The subsoil is about 9 inches thick. The upper part is olive gray fine sandy loam, and the lower part is light olive gray silt loam. The substratum to a depth of about 60 inches is light gray silt and very fine sand. In some areas the surface layer is organic and is less than 10 inches thick. In some small areas sand and gravel are at a depth of 4 to 5 feet.

Included with this soil in mapping are Kibbie, Palms, Wacousta, and Yahara soils. These soils make up 10 to 20 percent of the unit. The Kibbie soils are similar to the Keowns soil but are somewhat poorly drained and have a more distinct subsoil. The very poorly drained Palms soils have a thick organic layer. The poorly drained and very poorly drained Wacousta soils are silty throughout. The somewhat poorly drained Yahara soils formed in material similar to that in which the Keowns soil formed. They are above the Keowns soil on the landscape.

Water and air move through this soil at a moderate rate. Surface runoff is slow or ponded. Available water capacity is high. Organic-matter content is high, and natural fertility is low. The surface layer is friable and is best tilled when not too wet. The seasonal high water table is at the surface or within a depth of 1 foot.

Many areas are farmed. Some remain in grasses, and some are used as pasture or wildlife habitat. If drained, this soil has good potential for growing corn and soybeans and for growing grasses for hay and pasture. It has poor potential for growing oats and other small grain. The potential for growing trees is good, and the potential for most engineering uses is poor.

If adequately drained and protected against flooding, this soil is well suited to growing corn and soybeans and to growing grasses for hay and pasture. It is poorly suited to growing oats and other small grain and well suited to growing trees. The water table can be lowered by open ditch drains and in places by carefully placed tile drains. Diversions that intercept runoff or seepage from nearby slopes also are beneficial. Because of the stratified material between depths of 24 and 60 inches, onsite inspection is needed to determine the feasibility of tile drains. If the soil is too silty or sandy for normal tile drains, fiberglass blankets can be used to reduce the flow of soil into the tile. Perennial plants selected for planting should be tolerant of wetness. Minimum tillage, return of crop residue to the soil, and timely tillage help to maintain or improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet destroys the pasture and causes surface compaction, poor tilth, and ponding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during

wet periods help to keep the pasture and the soil in good condition. They are extremely important because this soil is difficult to drain.

This soil is suitable for the production of wood. In areas where natural regeneration is unreliable, planting by hand or machine on prepared ridges is needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus allow natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table, the frequent flooding, and the unstable nature of soil material, all of which are very difficult to overcome. Capability subclass IIIw; woodland suitability subclass 1w.

KdA—Kibbie fine sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is in old lake basins and on outwash plains. It is flooded on rare occasions. Slopes are slightly convex or plane. Individual areas are long or irregular in shape and range from 2 to 60 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 26 inches thick. The upper part is brown loam; the middle part is brown, mottled clay loam and sandy clay loam; and the lower part is yellowish brown, mottled loam. The substratum to a depth of about 60 inches is yellowish brown, light brownish gray, and pale brown fine sand and silt. In some small areas the surface layer is thicker and darker. In a few areas it is silt loam. In a few areas stratified sand and gravel are at a depth of 4 to 5 feet.

Included with this soil in mapping are areas of Keowns, Lamartine, Sisson, and Tuscola soils. The poorly drained Keowns soils formed in material similar to that in which this Kibbie soil formed. They are below areas of the Kibbie soil. The somewhat poorly drained Lamartine soils are next to the Kibbie soil on the landscape. They are underlain by sandy loam glacial till. The well drained Sisson soils and the moderately well drained Tuscola soils are above the Kibbie soil on the landscape.

Air and water move through this soil at moderate rate. Surface runoff is slow. Organic-matter content is moderate, and natural fertility is medium. Available water capacity is high. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The roots of many crops are restricted by the stratified silt and fine sand below a depth of about 35 inches. The seasonal high water table is at a depth of 1.5 to 2 feet.

Some areas are farmed, and some remain in grasses and are used for pasture or wildlife habitat. If drained, this soil has very good potential for cultivated crops and good potential for growing grasses for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn, soybeans, small grain, and other cultivated crops. It is well suited to growing grasses for hay and pasture. If suitable outlets are available, the water table can be lowered by open ditch drains. Diversions that intercept runoff or seepage from higher lying slopes are also beneficial. Runoff from the nearby slopes can be channelled by grassed waterways. Fiberglass blankets help to protect tile drains from the entry of silt and very fine sand. The best system of artificial drains can be determined only after onsite inspection. Perennial plants selected for planting should be those that can tolerate some wetness. Soil blowing is a hazard if this soil is drained and cultivated. Cover crops, windbreaks, a mulch of crop residue, and minimum tillage are helpful in reducing this hazard. They also maintain and improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet destroys pasture. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table, low strength in the subsoil, and low stability in the substratum. The water table can be lowered by open ditch drains. The material having low strength can be replaced by suitable subbase material. The suitability for onsite sewage disposal can be improved by building a filtering mound of suitable material. Capability subclass IIw; woodland suitability subclass 1o.

KeB—Kidder sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on drumlins and ground moraines. Slopes are plane or slightly convex. Individual areas are generally long and of varying width. They range from 2 to 160 acres in size.

Typically, the surface layer is dark brown sandy loam about 7 inches thick. The subsoil is about 22 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In some areas the surface layer is fine sandy loam. In some small areas the solum is more than 40 inches thick.

Included with this soil in mapping are small areas of Chelsea, Griswold, Lamartine, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The excessively drained sandy Chelsea soils are on foot slopes below the Kidder soil. The well drained Griswold soils and the Kidder soil are in similar landscape positions, but the Griswold soils have a thicker, darker colored surface layer. Lamartine soils are in depressions and are

somewhat poorly drained and silty. The well drained Rotamer soils and the Kidder soil are in similar landscape positions, but the Rotamer soils are shallower to the underlying gravelly sandy loam glacial till.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and good potential for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and winter cover crops help to prevent excessive soil blowing and conserve moisture. Long slopes and a highly erodible topsoil are problems that must be solved if this soil is to be kept in cultivated crops. Minimum tillage, winter cover crops, contour stripcropping, and grassed waterways help to control erosion. Returning crop residue to the soil or adding other organic material improves tilth and fertility and reduces the risk of erosion.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil has only fair potential for building site development because of the moderate shrink-swell potential and low strength in the subsoil. The limitations in the subsoil can be avoided by placing footings in the more stable substratum. This soil is poorly suited to onsite waste disposal. It is well suited to septic tank absorption fields. Sealing the bottom and sides of landfills and sewage lagoons helps to prevent seepage. Capability subclass IIe; woodland suitability subclass 2o.

KeC2—Kidder sandy loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on side slopes of ground moraines. Slopes are convex. Individual areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is brown sandy loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In some small areas the upper part of the soil is more than 18 inches of sandy loam.

Included with this soil in mapping are small areas of Chelsea, Griswold, Lamartine, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The somewhat excessively drained sandy Chelsea soils are on foot slopes below the Kidder soil. The well drained Griswold soils have a thicker, darker colored surface layer than the Kidder soil. The Lamartine soils are in depressions below areas of the Kidder soil. They have a silty mantle and are somewhat poorly drained. The well drained Rotamer soils and the Kidder soil are in similar landscape positions. The Rotamer soils are less than 24 inches deep over gravelly sandy loam glacial till.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. The highly erodible sandy loam surface layer is rapidly gullied. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is medium.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is subject to soil blowing. The erosion hazard is severe. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to prevent soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material help in preparing an adequate seedbed by improving tilth, fertility, and the water infiltration rate. Reduced seeding rates for cultivated crops also help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the slope. Placing footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope also is beneficial.

This soil is mostly poorly suited to onsite waste disposal. It is moderately well suited to septic tank absorption fields. Proper placement of the absorption fields and modification of the slope during construction help to reduce the limitation caused by slope. This soil is poorly suited as a site for landfills and sewage lagoons. A large amount of earth must be moved to construct a lagoon on this sloping soil. The bottom and sides of excavations are

porous and should be sealed with impervious material, such as the finer textured subsoil. Capability subclass IIIe; woodland suitability subclass 2o.

KfB—Kidder loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on side slopes on drumlins and ground moraines. Slopes are convex. Individual areas are irregular in shape and range from 2 to 140 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 20 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In some areas the surface layer is sandy loam or silt loam.

Included with this soil in mapping are moderately well drained Kidder soils and Lamartine, Rotamer, and Theresa soils. These soils make up 2 to 20 percent of the unit. The moderately well drained Kidder soils are below areas of this Kidder soil. They have a seasonal high water table at a depth of more than 2.5 feet. The somewhat poorly drained silty Lamartine soils are in depressions. They have a seasonal high water table at a depth of 1 foot to 3 feet. The well drained Rotamer soils and this Kidder soil are in similar landscape positions. The Rotamer soils are shallower to the underlying gravelly sandy loam. The well drained Theresa soils are adjacent to the Kidder soil. They have a thin silty mantle, which is generally lacking in Kidder soils.

Water and air move through this soil at a moderate rate. Surface runoff is medium, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is medium.

Most areas are farmed. Some are in woodland. This soil has good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and winter cover crops help to control erosion and conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development because of the shrink-swell potential and low strength in the subsoil. The limitations in the subsoil can be avoided by placing footings in the more stable substratum. This soil is mostly poorly suited to onsite waste disposal because of seepage. It is well suited as a septic tank absorption field. Capability subclass IIe; woodland suitability subclass 2o.

KfC2—Kidder loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on side slopes of drumlins and ground moraines. Slopes are convex. Individual areas are irregular in shape or are long and narrow and range from 3 to 70 acres in size.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In some small areas the surface layer is silt loam or sandy loam.

Included with this soil in mapping are Lamartine, Rotamer, and Theresa soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Lamartine soils are in depressions. They have a silty mantle. The well drained Rotamer soils and the Kidder soil are in similar landscape positions. The Rotamer soils are less than 24 inches deep over the underlying gravelly sandy loam till. The well drained silty Theresa soils are adjacent to areas of the Kidder soil. In some small areas the water table is seasonally perched at a depth of 36 to 60 inches.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content is moderate, and natural fertility is medium. Surface crusting can be a problem.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and good potential for grasses and legumes for hay and pasture. It has good potential for growing trees and fair potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The erosion hazard is severe. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control erosion and conserve moisture. Returning crop residue to the soil and adding other organic material help in preparing an adequate seedbed by improving organic-matter content, tilth, fertility, and the rate of water infiltration. Reduced seeding rates for cultivated crops help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can

be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is moderately well suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the slope. Placement of footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope also is beneficial.

This soil is poorly suited to onsite waste disposal. It is moderately well suited as a septic tank absorption field. Proper placement of septic tank absorption fields and slope modification during construction help to reduce the limitation caused by slope. This soil is poorly suited as a site for sewage lagoons and sanitary landfills because of seepage and slope. Generally, the bottom and sides of excavations can be sealed with material from the finer textured subsoil. Regrading minimizes the limitation caused by slope. Capability subclass IIIe; woodland suitability subclass 2o.

KfD2—Kidder loam, 12 to 20 percent slopes, eroded. This moderately steep, well drained soil is on the lower side slopes of drumlins. Slopes are convex. Individual areas are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 18 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown gravelly sandy loam. In most places the surface layer is mixed with the subsoil. In areas where erosion has been extensive, the surface layer is sandy clay loam.

Included with this soil in mapping are small areas of Lamartine, Rotamer, and Theresa soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained silty Lamartine soils are in depressions below areas of this Kidder soil. The well drained Rotamer soils and this Kidder soil are in similar landscape positions. The Rotamer soils are shallower to the underlying gravelly sandy loam. The well drained silty Theresa soils are above areas of this Kidder soil.

Water and air move through this soil at a moderate rate. Available water capacity is moderate. Runoff is rapid. This soil is more difficult to work than uneroded soils because of mixing of the subsoil with the surface layer. The shrink-swell potential is moderate in the subsoil. Organic-matter content is moderate in the surface layer. Natural fertility is medium.

Most areas are farmed. Some are used as woodland and others as wildlife habitat. This soil has fair potential for cultivated crops and for grasses and legumes for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

This soil is moderately well suited to growing corn and small grain and to grasses and legumes for hay or pasture. The erosion hazard is severe. Minimum tillage, contour stripcropping, diversions, and grassed waterways will help to control further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material help in preparing an adequate seedbed by improving tilth, fertility, and the rate of water infiltration and by reducing crusting. Reduced seeding rates for cultivated crops help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The soil-related forest management problems are the moderately steep slope and the encroachment of brush following harvest. Contouring in areas where trees are planted and careful location of skid roads during harvest help to minimize erosion and improve trafficability for equipment. Seedling survival on the steeper slopes facing south or west can be improved by care in planting and by selection of vigorous planting stock. Suitable herbicides provide effective control of the brush that competes with regeneration following harvest. The brush can be removed mechanically if it is a problem. Skidding can expose sufficient mineral soil to allow adequate regeneration.

This soil is poorly suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the moderately steep slope. Placing footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope also is beneficial.

This soil is poorly suited to onsite waste disposal. Proper placement of septic tank absorption fields and extra care during construction help to reduce the limitation caused by slope and prevent the surfacing of effluent on the downslope side of the fields. Extensive movement of earth is needed during site preparation on this moderately steep soil. Some regrading is needed to minimize the slope and aid in the overall use of the site. Capability subclass IVe; woodland suitability subclass 2r.

KgB—Kidder loam, moderately well drained, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on the lower side slopes and foot slopes of drumlins and in areas between drumlins. Slopes are convex. Individual areas are long and range from 2 to 40 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsurface layer is grayish brown loam about 5 inches thick. The subsoil is about 20 inches thick. The upper part is brown loam; the middle part is brown clay loam; and the lower part is brown, mottled sandy clay loam. The substratum to a depth of about 60 inches is pale brown and brown, mottled gravelly sandy loam. In some areas the surface layer is sandy loam or silt loam. In places the water table is at a depth of more than 6 feet. In some places the slope is 0 to 2 percent, and in others depth to the substratum is more than 40 inches.

Included with this soil in mapping are small areas of other Kidder soils and of Dodge, Rotamer, and Lamartine soils. These soils make up 5 to 15 percent of the unit. The other Kidder soils are well drained and are above areas of this Kidder soil. The well drained Rotamer soils are shallower to the underlying glacial till than this Kidder soil. They are above this soil on the landscape. The well drained Dodge soils have a silty mantle. They are on the higher parts of the landscape. The somewhat poorly drained Lamartine soils have a silty overburden. They are in depressions.

Water and air move through this soil at a moderate rate. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of more than 2.5 feet.

Most areas are farmed. This soil has good potential for growing cultivated crops, grasses and legumes, and trees. It has fair potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and winter cover crops help to prevent excessive soil loss and conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration. Contouring, contour stripcropping, diversions, and grassed waterways help to control erosion.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential and low strength in the subsoil and the seasonal high water table at a depth of more than 2.5 feet. The effects of shrinking and swelling and low strength can be avoided by placing footings in the more stable substratum. Open ditches and tile drains can lower the water table.

This soil is poorly suited to onsite waste disposal. Septic tank absorption fields function poorly because of the seasonal high water table. In places a filtering mound of suitable material improves the suitability for septic tank absorption fields. Capability subclass IIe; woodland suitability subclass 2o.

LaB—Lamartine silt loam, 2 to 6 percent slopes. This gently sloping, somewhat poorly drained soil is on the lower side slopes of drumlins and ground moraines. It is occasionally flooded. Individual areas are irregular in shape and range from 2 to 80 acres in size. Slopes are plane or concave.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 19 inches thick. The upper part is brown, mottled silt loam; the middle part is dark brown, mottled silty clay loam; and the lower part is brown, mottled clay loam. The substratum to a depth of about 60 inches is light yellowish brown, mottled sandy loam.

Included with this soil in mapping are some areas where the surface layer and subsoil are loamy rather than silty; some small areas that are slightly better drained; areas that are more poorly drained; and areas where the subsoil extends to a depth of more than 40 inches. Also included are small areas of Barry, Dodge, Rotamer, and Theresa soils. Barry soils are similar to this Lamartine soil but are lower on the landscape and are poorly drained. The well drained Dodge, Rotamer, and Theresa soils are higher on the landscape than the Lamartine soil. The Dodge and Theresa soils have a lighter colored surface layer, and the Rotamer soils are shallower over gravelly sandy loam glacial till.

Water and air move through this soil at a moderate rate. Surface runoff is medium, and water ponds in depressions during and after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. A small acreage is woodland or is in grass. If drained, this soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, a combination of diversions, open ditches, and tile drains effectively lowers the water table. Tilth and fertility are maintained, puddling is reduced, and the percolation rate is increased if tillage is timely, crop residue is returned to the soil or other organic material is regularly added, and a green manure crop is occasionally plowed under.

Overgrazing or grazing when the soil is too wet causes surface compaction, ponding, and puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. Control of grazing is especially important because the soil is naturally wet and the surface layer puddles easily.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to most engineering uses because of the seasonal high water table, the low strength in the subsoil, and the occasional flooding. Building sites

are improved if the water table is lowered and footings are properly designed for the correct size and are placed in stable soil material. The suitability for septic tank absorption fields can be improved by a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 2o.

LyB—Lorenzo sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on outwash plains. Slopes are slightly convex. Individual areas are long or round and range from 5 to 90 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsoil is about 10 inches thick. It is reddish brown coarse sandy loam and dark reddish brown sandy clay loam in the upper part and dark brown clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In places the solum is more than 18 inches thick. In severely eroded areas, the surface layer is sandy clay loam.

Included with this soil in mapping are small areas of Casco, Chelsea, and Fox soils. These soils make up 5 to 20 percent of the unit. The well drained and somewhat excessively drained Casco soils have a lighter colored, more clayey surface layer than this Lorenzo soil. They occur in similar landscape positions. The excessively drained Chelsea soils are on the lower foot slopes along the bottom edge of areas of this Lorenzo soil. They are sandy throughout. The well drained Fox soils have a thicker subsoil and a lighter colored, more clayey surface layer than the Lorenzo soil. They are in similar landscape positions. Also included are small areas of Rodman and Wasepi soils. The excessively drained Rodman soils are along the upper edge of areas of the Lorenzo soil. They have a thinner subsoil. The somewhat poorly drained Wasepi soils are in the lower areas.

Available water capacity is low. Organic-matter content is high, and natural fertility is low.

Many areas are used as woodland or wildlife habitat. Some are farmed. This soil has fair potential for growing cultivated crops and for hay and pasture. It has fair potential for growing trees and for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and to growing grasses and legumes for hay and pasture. Drought is a severe hazard and water erosion a moderate hazard. Soil blowing is a hazard if the soil is bare. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to reduce further soil loss and conserve moisture. Returning crop residue to the soil and adding an extra amount of other organic material help in the preparation of an adequate seedbed by improving tilth, fertility, and water infiltration. As a result of the increased infiltration rate, runoff is reduced. Substantially reduced seeding rates for cultivated crops help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture in good condition.

This soil is suitable for the production of wood. Survival of planted trees during dry periods can be improved by careful planting of vigorous nursery stock. Harvesting by clear-cut or area-selection methods reduces the windthrow hazard to the remaining trees. Vegetation that competes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil is well suited to building site development. It is poorly suited to most methods of onsite waste disposal because of the very rapid permeability below a depth of 18 inches. The suitability for sewage lagoons and landfill sites can be improved by sealing the bottom and sides of the excavation. This soil is well suited as a septic tank absorption field, but the effluent can contaminate ground water because of the rapid or very rapid permeability below a depth of 18 inches. Capability subclass IIIe; woodland suitability subclass 3d.

MgA—Martinton silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low terraces in old lake basins. Slopes are concave or plane. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 19 inches thick. The upper part is yellowish brown, mottled silty clay loam, and the lower part is light yellowish brown, very pale brown, and pale brown, mottled silty clay. The substratum to a depth of about 60 inches is light yellowish brown, mottled silt and clay. In some small areas the surface layer is loam or sandy loam. Some areas are slightly better drained or slightly more poorly drained than this soil.

Included with this soil in mapping are small areas of Aztalan, Kibbie, Milford, and Saylesville soils. These soils make up 2 to 10 percent of the unit. The somewhat poorly drained Aztalan soils are loamy in the upper story. The somewhat poorly drained Kibbie soils have a loamy subsoil and a silt and fine sand substratum. The poorly drained and very poorly drained Milford soils formed in material similar to that in which this Martinton soil formed. They are in depressions. The moderately well drained Saylesville soils also formed in similar material. They have a thinner, lighter colored surface layer than the Martinton soil and are higher on the landscape.

Water and air move through this soil at a moderately slow rate. Surface runoff is slow, and water concentrates in small depressions for short periods after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. Some areas are in pasture, and a very small acreage is idle. If drained, this soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has fair

potential for growing trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, artificial drainage can help to remove excess water. Because of the slow permeability in the subsoil, tile drains should be placed at somewhat close intervals and as shallow in the soil as design permits. Timeliness of tillage, minimum tillage, and regular additions of crop residue or other organic material help to maintain tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. If allowed to compact, the surface layer restricts percolation enough for artificial drainage systems to function poorly.

This soil is poorly suited to the production of wood. Trees grow slowly and have poor form. Soil-related forest management problems are minor.

This soil is poorly suited to building site development and most onsite waste disposal systems. It is well suited as a site for sewage lagoons. Because of the seasonal high water table and the moderately slow permeability, it is difficult to improve for most uses. Buildings constructed on this soil should be specially designed so that footings are of adequate size and at a proper depth. Drainage lowers the water table and prevents flooding of basements or the lower stories. Capability subclass IIw; woodland suitability subclass 4o.

MgB—Martinton silt loam, 2 to 6 percent slopes. This gently sloping, somewhat poorly drained soil is on low terraces in old lake basins. Slopes are plane or slightly convex. Individual areas are long and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark brown silt loam about 3 inches thick. The subsoil is about 16 inches thick. The upper part is yellowish brown, mottled silty clay loam, and the lower part is light yellowish brown, very pale brown, and pale brown, mottled silty clay. The substratum to a depth of about 60 inches is yellowish brown, mottled silt and clay. In some small areas the surface layer is loam or sandy loam. Some areas are slightly better drained or slightly more poorly drained than this soil.

Included with this soil in mapping are small areas of Aztalan, Hebron, Saylesvile, and Tuscola soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Aztalan soils and the well drained and moderately well drained Hebron soils have a thick loamy upper story. The moderately well drained Saylesville soils formed in material similar to that in which this Martinton soil formed. They have a thinner, lighter colored surface layer. The moderately well drained Tuscola soils have a loamy subsoil.

Water and air move through this soil at a moderately slow rate. Surface runoff is slow, and water concentrates in small depressions for short periods after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. Some are in pasture. If drained, this soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, artificial drainage can help to remove excess water. Because of the slow permeability in the subsoil, tile drains should be placed at somewhat close intervals and as shallow in the soil as design permits. Timeliness of tillage, minimum tillage, and regular additions of crop residue or other organic material help to maintain tilth and fertility, reduce crusting, and increase the rate of water infiltration. Contouring, contour stripcropping, and grassed waterways help to control erosion. Diversions that intercept runoff from higher lying slopes help to control erosion and improve drainage.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. If allowed to compact, the surface layer restricts percolation enough for drainage systems to function poorly.

This soil is poorly suited to the production of wood. Trees grow slowly and have poor form. Soil-related forest management problems are minor.

This soil is poorly suited to building site development and most onsite waste disposal systems. It is well suited as a site for sewage lagoons. Because of the seasonal high water table and the moderately slow permeability, it is difficult to improve for most uses. Buildings constructed on this soil should be specially designed so that footings are of adequate size and at a proper depth. Drainage helps to lower the water table and prevents flooding of basements or the lower stories. Capability subclass IIe; woodland suitability subclass 4o.

MmA—Matherton silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on terraces on outwash plains. It is flooded on rare occasions. Slopes are slightly concave or plane. Individual areas are long and irregularly shaped and range from 3 to 60 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown, mottled silt loam; the middle part is brown, mottled sandy clay loam and grayish brown, mottled clay loam; and the lower part is grayish brown, mottled sandy clay loam and brown, mottled loamy sand. The substratum to a depth of about

60 inches is light gray sand and gravel. In some small areas the surface layer is thicker and darker. In others layers of very fine sand and silt are in the substratum.

Included with this soil in mapping are small areas of Aztalan and Fox soils, the Matherton soils that have a clayey substratum, and Sebewa and Wasepi soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Aztalan soils have a thicker surface layer than this Matherton soil and are clayey in the lower part of the subsoil and in the substratum. The well drained Fox soils and this Matherton soil formed in similar material. The somewhat poorly drained Matherton soils have clayey material below the sand and gravel in the substratum. The poorly drained and very poorly drained Sebewa soils formed in material similar to that in which this Matherton soil formed. The somewhat poorly drained Wasepi soils are coarser textured than this Matherton soil and are underlain by sand and gravel.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow. Natural fertility is medium, and organic-matter content is high. Available water capacity is moderate. The surface layer is friable, but it puddles if tilled when wet. The roots of many crops are restricted by the sand and gravel below a depth of about 33 inches. The seasonal high water table is at a depth of 1 foot to 2 feet.

Some areas are farmed, and some remain in grasses and are used as pasture or wildlife habitat. If drained, this soil has good potential for growing cultivated crops and very good potential for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to grasses for hay and pasture. The water table can be lowered by open ditch drains. Diversions that intercept runoff or seepage from higher lying slopes are also beneficial. Perennial plants selected for planting should be tolerant of some wetness. Minimum tillage, a mulch of crop residue, additions of other organic material, and timeliness of tillage help to maintain or improve tilth, permeability, and organic-matter content. Applying lime and fertilizer according to soil tests helps to maintain and improve fertility.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal. Open ditches lower the water table around foundations and footings. Capability subclass IIw; woodland suitability subclass 3o.

MnA—Matherton silt loam, clayey substratum, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on terraces on outwash plains. It is subject to occasional flooding. Slopes are slightly convex or plane. Individual areas are long or irregularly shaped and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown, mottled silt loam; the middle part is brown and grayish brown, mottled sandy clay loam and clay loam; and the lower part is grayish brown, mottled sandy clay loam. The substratum to a depth of about 60 inches is 13 inches of light gray sand and gravel over 12 inches of gray, stratified silty clay and silty clay loam. In some small areas the surface layer is thicker and darker. In others, the silt and clay are not evident in the substratum or the substratum is very fine sand and silt.

Included with this soil in mapping are small areas of Aztalan and Hebron soils and the Sebewa soil that has a clayey substratum. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Aztalan soils and the well drained and moderately well drained Hebron soils are thinner over silt and clay than this Matherton soil. The Sebewa soil is poorly drained and very poorly drained.

Water and air move through the subsoil of this Matherton soil at a moderate rate and through the lower part of the substratum at a moderately slow rate. Surface runoff is slow. Natural fertility is medium, and organic-matter content is high. Available water capacity is moderate. The surface layer is friable but is best tilled when not too wet. The roots of many crops are restricted by the sand and gravel or silt and clay below a depth of about 30 inches. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. Some remain in grasses and are used as pasture or wildlife habitat. If drained, this soil has good potential for growing cultivated crops and for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to grasses for hay and pasture. The water table can be lowered by open ditch drains or possibly by tile. Because of the moderately slow permeability at a depth of 30 to 60 inches, designing a good drainage system is difficult. The best system can be determined only after an onsite inspection. Diversions that intercept runoff from higher lying slopes can be helpful. Perennial plants selected for planting should be tolerant of some wetness. A mulch of crop residue, timeliness of tillage, and minimum tillage help to maintain or improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table and the low strength. Open ditches help to lower the water table around foundations and footings. Special design and placement of footings help to overcome the low strength. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIw; woodland suitability subclass 3o.

MoB—Mayville silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on ground moraines and drumlins. Slopes are plane or concave. Individual areas are irregular in shape and range from 3 to 75 acres in size.

Typically, the surface layer is dark gray silt loam about 9 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 26 inches thick. The upper part is brown silty clay loam, and the lower part is brown and yellowish brown, mottled clay loam. The substratum to a depth of about 60 inches is light gray and yellowish brown, mottled gravelly sandy loam. In a few small areas 10 to 20 inches of loamy material overlies the silty material.

Included with this soil in mapping are small areas of Lamartine, St. Charles, Theresa, and Virgil soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Lamartine soils formed in material similar to that in which this Mayville soil formed. The moderately well drained St. Charles soils have a thicker silty mantle than the Mayville soil. The well drained Theresa soils are less acid in the subsoil than the Mayville soil. The somewhat poorly drained Virgil soils have a darker colored surface layer and a thicker silty mantle than the Mayville soil.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is high. The surface layer is friable and is best tilled when moist. The seasonal high water table is at a depth of 3 to 5 feet.

Most areas are farmed. Some are in woodland. This soil has good potential for growing cultivated crops and very good potential for hay and pasture. It has good potential for growing trees and fair to poor potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terracing, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, or the regular addition of other organic material, and minimum tillage improve fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is moderately well suited to building site development because of low strength in the subsoil. This limitation can be overcome by special care in the design and placement of footings.

This soil is poorly suited to onsite waste disposal. It is poorly suited to trench-type landfills and to sewage lagoons because of seepage and the seasonal high water table. The suitability for these uses can be improved by providing drainage and by sealing the bottom and sides of the lagoon or trench with the more clayey subsoil material. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 2o.

MpB—McHenry silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on till plains. Slopes are convex. Individual areas are narrow or irregularly shaped and range from 3 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is brown silt loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is brown sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown and light yellowish brown gravelly sandy loam. In some small areas the solum is more than 50 inches thick.

Included with this soil in mapping are small areas of Dodge, Kidder, and Rotamer soils. These soils make up 5 to 10 percent of the unit. The well drained Dodge soils have a thicker silty mantle than this McHenry soil. The well drained and moderately well drained Kidder soils lack the silty mantle characteristic of the McHenry soil. The well drained Rotamer soils also lack the silty mantle and have a thinner solum. Also included are a few small areas where a seasonally perched water table is at a depth of 3 to 6 feet.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The surface layer is friable and is best tilled when fairly dry.

Most areas are farmed. Some are in woodland. This soil has good potential for growing cultivated crops and pasture grasses and very good potential for growing hay. It has good potential for growing trees and for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain. It is very well suited to growing grasses and legumes for hay and well suited to pasture grasses. Terracing, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, or the regular addition of other organic material, and minimum tillage improve tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential and low strength in the subsoil. These limitations can be avoided by placing footings in the more stable substratum.

This soil is well suited as a septic tank absorption field. It is poorly suited as a site for trench-type sanitary landfills and for sewage lagoons because of seepage. The suitability can be improved, however, by sealing the bottom and sides of the excavation with the more clayey subsoil material. Capability subclass IIe; woodland suitability subclass 2o.

MpC2—McHenry silt loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on till plains and drumlins. Slopes are convex. Individual areas are long and narrow and range from 3 to 20 acres in size.

Typically, the surface is dark brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is brown silt loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is brown sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown and light yellowish brown gravelly sandy loam. In a few areas slopes are less than 6 or more than 12 percent.

Included with this soil in mapping are small areas of Dodge, Kidder, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The well drained Dodge soils have a thicker silty mantle than this McHenry soil. The well drained and moderately well drained Kidder soils lack the silty mantle. The well drained Rotamer soils also lack the silty mantle and are shallower to the substratum. In a few small areas a seasonally perched water table is at a depth of 3 to 6 feet.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. Available water capacity would be higher and runoff lower if this soil were not eroded.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and grasses for pasture. It has good potential for growing legumes and grasses for hay, good potential for growing trees, and fair potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain and to grasses for pasture. It is very well suited to growing grasses and legumes for hay. The hazard of water erosion is severe. Minimum tillage, crop rotation, contour stripcropping, diversions, and grassed waterways help to control further soil loss and conserve moisture. Also, the soil can be terraced in areas where the solum is nearly 36 inches thick. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving tilth, fertility, and water infiltration and by reducing crusting.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poorer tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods are beneficial.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the sloping topography. Placing footings in the more stable substratum is helpful. Regrading sites to a more gentle slope makes the soil more manageable.

This soil is moderately well suited as a septic tank absorption field. Proper placement of absorption fields and slope modification during construction reduce the limitation caused by slope. This soil is poorly suited as a site for trench-type sanitary landfills and for sewage lagoons. Regrading minimizes the limitation caused by slope. Sealing the bottom and sides of excavations with a blanket of the finer textured subsoil material helps to reduce seepage. Capability subclass IIIe; woodland suitability subclass 2o.

Mr—Milford silty clay loam. This nearly level, poorly drained and very poorly drained soil is on terraces in old lake basins. It is subject to occasional flooding. Slopes are plane or concave. Individual areas are irregular in shape and range from 4 to 650 acres in size.

Typically, the surface layer is black silty clay loam about 11 inches thick. The subsoil is about 17 inches thick. It is dark gray silty clay loam in the upper part; light brownish gray, mottled silty clay in the middle part; and light brownish gray, mottled silty clay loam in the lower part. The substratum to a depth of about 60 inches is light brownish gray and gray silt and clay. In some small areas the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of Martinton and Palms soils, the Sebewa soil that has a clayey substratum, and Wacousta soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Martinton soils formed in material similar to that in which this Milford soil formed. The very poorly drained Palms soils have a 16- to 51-inch organic layer over the mineral material. The poorly drained and very poorly drained Sebewa soil has a thick layer of loamy and sandy outwash over lake-laid silt and clay. The poorly drained and very poorly drained Wacousta soils lack the clay layer in the substratum that is characteristic of the Milford soil.

Water and air move through this soil at a moderately slow rate. Surface runoff is slow, and water concentrates in small depressions for long periods after heavy rains. Available water capacity is high. Organic-matter content is high, and natural fertility is medium. The seasonal high water table is at the surface or within a depth of 2 feet.

Many areas are farmed. Some are in pasture. Undrained areas are in native vegetation. This soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture if it is drained. It has fair potential for growing small grain and trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn and soybeans and to grasses and legumes for hay and pasture. It is moderately well suited to small grain. Because of the moderately slow permeability in the subsoil and the shallowness to stratified silt and clay, tile drains should be placed at somewhat close intervals and as shallow in the soil as design permits. Timeliness of tillage, minimum tillage, and regular additions of crop residue or other organic material help to maintain tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. If allowed to compact, the surface layer restricts percolation enough for artificial drainage systems to function poorly.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. If natural regeneration is unreliable, planting by hand or machine on prepared ridges is generally needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus permit natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal. Because of the seasonal high water table and the moderately slow permeability, it is difficult to improve for most uses. Capability subclass IIw; woodland suitability subclass 4w.

MvB—Moundville loamy sand, 1 to 6 percent slopes. This nearly level and gently sloping, moderately well drained soil is on outwash plains. Slopes are slightly convex or plane. Individual areas are long or irregularly shaped and range from 3 to 140 acres in size.

Typically, the surface layer is dark brown loamy sand about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown loamy sand, and the lower part is yellowish brown, mottled sand. The substratum to a depth of about 60 inches is light yellowish brown, mottled sand. In some small areas the surface layer is thicker and darker colored. In others, layers of very fine sand and silt are in the substratum.

Included with this soil in mapping are areas of Boyer, Chelsea, and Watseka soils. These soils make up 5 to 15 percent of the unit. The well drained Boyer soils contain more clay in the subsoil and more gravel in the substratum than this Moundville soil. The excessively drained Chelsea soils have a slightly thinner surface layer than the Moundville soil and contain slightly less clay in the subsoil. The somewhat poorly drained Watseka soils formed in material similar to that in which the Moundville soil formed.

Water and air move through this soil at a rapid rate. Surface runoff is medium. Natural fertility is low, and organic-matter content is moderately low. Available water capacity is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The roots of many crops are restricted by the sand below a depth of about 36 inches. The seasonal high water table is at a depth of 2.5 to 3.5 feet.

Some areas are farmed, and some are in native grasses and are used as pasture or wildlife habitat. This soil has poor potential for growing cultivated crops and fair potential for growing grasses and legumes for hay and pasture. It has fair potential for growing trees and for most engineering uses.

This soil is poorly suited to growing corn, soybeans, and small grain and is moderately well suited to growing grasses for hay and pasture. Soil blowing and soil erosion are hazards if the soil is cultivated. Cover crops, windbreaks, contouring, a mulch of crop residue, and minimum tillage are helpful in reducing these hazards. They also can help to maintain or improve tilth, permeability, and organic-matter content and conserve moisture. Weed control is also helpful in conserving moisture. Substantially reduced seeding rates help to insure an adequate amount of moisture for all plants.

If this soil is used for pasture, proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during very dry or very wet periods keep the sod in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil is generally well suited to building site development. It is poorly suited to onsite waste disposal because of the rapid permeability and the seasonal high water table. Buildings with basements and septic tank absorption fields benefit if the water table is lowered by open ditch drains. Capability subclass IVs; woodland suitability subclass 3s.

Ot—Otter silt loam. This nearly level, poorly drained, soil is on stream bottoms. It is subject to frequent flooding. Slopes are plane. Individual areas are long and range from 3 to 60 acres in size.

Typically, the surface layer is black silt loam about 8 inches thick. The subsurface layer is black and very dark gray silt loam about 22 inches thick. The subsoil is mottled silt loam about 11 inches thick. It is dark gray in the upper part and gray in the lower part. The substratum to a depth of about 60 inches is olive gray, mottled silt loam. In a few places the surface layer is lighter colored.

Included with this soil in mapping are small areas of Palms and Wacousta soils. These soils make up 5 to 20 percent of the mapped areas. The very poorly drained Palms soils have an organic layer that is 16 to 51 inches thick over silty material. The poorly drained and very poorly drained Wacousta soils contain more clay in the solum than the Otter soil.

Water and air move through this soil at a moderate rate. Surface runoff is slow, and water ponds in depressions after flooding. Available water capacity is very high. Organic-matter content and natural fertility are high. The seasonal high water table is at the surface or within a depth of 2 feet.

Some areas are farmed, and some are in native vegetation. If drained and protected against flooding, this soil has very good potential for cultivated crops and good potential for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If drained and protected against flooding, this soil is very well suited to growing corn and soybeans. It has fair potential for small grain and good potential for growing grasses and legumes for hay and pasture. If flooding is controlled and suitable outlets are available, a combination of open ditches and drainage tile can effectively lower the water table. Timeliness of tillage improves tilth, maintains fertility, reduces puddling, and increases the rate of water percolation.

The surface layer of this soil puddles easily. Overgrazing or grazing when the soil is too wet causes surface compaction and destroys tilth in the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. If natural regeneration is unreliable, planting by hand or machine on prepared ridges is generally needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus allow natural regeneration.

This soil is poorly suited to most engineering uses because of the seasonal high water table, the frequent flooding, and the low strength. Capability subclass IIw; woodland suitability subclass 2w.

Pa—Palms muck. This nearly level, very poorly drained, organic soil is in depressions in old lake basins. It is subject to frequent flooding. Slopes are plane. Individual areas are irregular in shape and range from 5 to 600 acres in size.

Typically, the organic layer is black muck about 31 inches thick. The substratum to a depth of about 60 inches is dark gray and dark grayish brown silt loam. In a few small areas thin layers of sandy, loamy, or clayey mineral material are in the organic layer. In some small areas the substratum has a layer of sand as much as 8 inches thick, and in others the loamy substratum has organic layers.

Included with this soil in mapping are small areas of Keowns, Houghton, and Wacousta soils. These soils make up 5 to 15 percent of the unit. The poorly drained Keowns soils are loamy and lack an organic layer. The very poorly drained Houghton soils have an organic layer that is more than 51 inches thick. The poorly drained and very poorly Wacousta soils lack an organic layer and are silty throughout.

Water and air move through this soil at a moderate rate. Available water capacity is very high. Organic-matter content also is very high, and natural fertility is low. The seasonal high water table is at the surface or within a depth of 1 foot.

Some areas are farmed, and some are in natural vegetation. If drained, this soil has good potential for cultivated crops and fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

If drained, this soil is well suited to growing corn and soybeans. It is moderately well suited to growing small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, a combination of open ditches and drainage tile can effectively lower the water table. Water-control structures help to prevent excessive oxidation and subsidence of the organic layer. Windbreaks, cover crops, and stubble mulch help to control soil blowing. Soil testing for fertilizer requirements is important in managing this soil properly. Macronutrients and micronutrients can be in short supply, and the deficiency severely limits crop yields.

If overgrazed or grazed when the soil is too wet, pasture is trampled. As a result, yeilds are reduced. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Wetness and the seasonal high water table during the tree-planting season limit reforestation to natural regenera-

tion. Harvesting with heavy equipment is confined to periods when the ground is frozen. Clear-cut or area-selection harvest methods are needed to avoid serious windthrow of the remaining trees. Brushy species competing with natural regeneration can be controlled by suitable herbicides or mechanical removal.

This soil is poorly suited to most engineering uses because of the frequent flooding, the seasonal high water table, and the low strength of the organic material. Building any kind of structure on this soil is very difficult because organic material is generally discarded on engineering projects. Capability subclass IIw; woodland suitability subclass 3w.

Pb—Palms muck, ponded. This nearly level, very poorly drained soil is in depressions in lake basins, especially along the edges of lakes and rivers. It is subject to frequent, prolonged flooding. Slopes are plane. Individual areas are mostly long or round and range from 2 to 75 acres in size.

Typically the surface layer is black muck about 31 inches thick. The substratum to a depth of about 60 inches is dark gray silty loam.

Included with this soil in mapping are small areas of Adrian, Houghton, Keowns, and Watseka soils and other Palms soils. These soils make up 10 to 25 percent of the unit. The very poorly drained Adrian soils are underlain by sand rather than silty or loamy material. The very poorly drained Houghton soils have an organic layer that is more than 51 inches thick. The somewhat poorly drained Watseka soils are sandy throughout. The poorly drained Keowns soils are loamy throughout. The Palms soils are similar to this Palms soil but generally are flooded for shorter periods.

Water and air move through this soil at a moderate rate. Surface runoff is slow or ponded, and water ponds in depressions for long periods. Available water capacity is very high. Organic-matter content also is very high, and natural fertility is low. The seasonal high water table is generally above the surface but ranges to a depth of 1 foot.

Areas of this soil remain in native vegetation, which consists of reeds, sedges, and cattails and a few water-tolerant shrubs. No areas are farmed. Drainage is extremely difficult because few outlets are available. This soil has poor potential for all cultivated crops, for pasture, for growing trees, and for most engineering uses.

If suitable outlets are available, a combination of open ditches and drainage tile can effectively lower the water table. Ditches and dikes are needed to reduce the risk of flooding.

Because this soil is flooded for most of the year, grazing is not a feasible use. If the soil is used for pasture, adequate drainage, proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods are needed to keep the pasture and the soil in good condition.

This soil is not suited to woodland. Some areas that have woody cover can be managed as recreation areas or wildlife habitat.

This soil is poorly suited to most engineering uses because of the seasonal high water table, the flooding, and the low strength of the organic material. Major reclamation is needed before the soil can be used as a site for most structures.

This soil is well suited to habitat for wetland wildlife, particularly fur bearers and waterfowl. Capability subclass Vw; woodland suitability subclass 3w.

Pg—Pits, gravel. This map unit consists of areas where several feet of sand and gravel or bedrock have been removed. These pits are in areas of sand and gravel outwash, glacial till, limestone, or sandstone, dominantly in areas of glacial outwash. Slopes are complex and convex. Most areas are long and narrow or oblong and range from 5 to more than 30 acres in size.

Included with this unit in mapping are areas of spoil, such as areas where the soil material has been removed from the adjacent pit and areas where stones or boulders are too large to crush. Water is on the bottom of a few abandoned pits. Not assigned to a capability subclass or woodland suitability subgroup.

RaA—Radford silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on flood plains and foot slopes. It is subject to frequent flooding. Individual areas are long and range from 2 to 25 acres in size. Slopes are slightly concave.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark grayish brown silt loam about 13 inches thick. Below this is a buried surface layer of black silty clay loam about 8 inches thick. The subsoil is mottled silty clay loam about 18 inches thick. It is dark gray in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam. In some places the surface layer and subsurface layer have thin layers of loam or sandy loam. In other places the silty alluvium is less than 20 inches thick over the buried surface layer.

Included with this soil in mapping are small areas of Juneau, Otter, and Wacousta soils. These soils make up 5 to 15 percent of the unit. The well drained and moderately well drained Juneau soils contain less clay in the substratum than this Radford soil and are higher on the landscape. The poorly drained Otter soils contain less clay in the subsoil and substratum than the Radford soil. The poorly drained and very poorly drained Wacousta soils lack the silt loam surface layer characteristic of the Radford soil.

Water and air move through this soil at a moderate rate. Available water capacity is very high. Organic-matter content and natural fertility are high. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. Some are in native vegetation. If adequately drained and protected against flooding, this soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has poor potential for growing trees and for most engineering uses.

If adequately drained and protected against flooding, this soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Ditches and grassed waterways help to control flooding. Diversions intercept runoff from nearby higher lying slopes. Tile drains can be used to lower the water table. The return of crop residue to the soil, or the regular addition of other organic material, and timeliness of tillage are important because tilth is very easily destroyed.

Overgrazing or grazing when the soil is too wet destroys tilth and causes surface compaction. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. If natural regeneration is unreliable, planting by hand or machine on prepared ridges is generally needed because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus permit natural regeneration.

This soil is poorly suited to most engineering uses. The frequent flooding, the seasonal high water table, and the low strength are difficult to overcome. Capability subclass IIw; woodland suitability subclass 4w.

RnB—Ringwood silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on till plains. Slopes are convex. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsurface layer is very dark grayish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is brown silty clay loam, the middle part is dark yellowish brown clay loam, and the lower part is dark yellowish brown sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown gravelly sandy loam. In some small areas the silty mantle is thicker than 30 inches, and in some areas the solum is thicker than 40 inches.

Included with this soil in mapping are small areas of Grellton, Griswold, St. Charles, and Virgil soils. These soils make up 2 to 15 percent of the unit. The well drained and moderately well drained Grellton soils are loamy in the upper part and have a thinner, lighter colored surface layer than this Ringwood soil. The well drained Griswold soils lack the silty mantle characteristic of the Ringwood soil. The moderately well drained St. Charles soils have a thicker silty mantle and a thinner, lighter colored surface layer. The somewhat poorly drained Virgil soils have a thicker silty mantle and a thinner surface layer.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content and natural fertility also are high. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

All areas are farmed. This soil has very good potential for growing cultivated crops and for hay and pasture. It has poor potential for growing trees and good to poor potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terraces, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, or the regular addition of other organic material, and minimum tillage help to maintain tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is not naturally forested and therefore is not usually managed for woodland.

This soil is only moderately well suited to building site development because of the shrink-swell potential and low strength in the subsoil. The limitations in the subsoil can be avoided by placing footings in the more stable substratum.

This soil is poorly suited to most methods of onsite waste disposal but is well suited as a septic tank absorption field. It is poorly suited to trench-type sanitary landfills and to sewage lagoons because of seepage. The suitability for these uses can be improved, however, by sealing the bottom and sides of excavations with the more clayey subsoil material. Capability subclass IIe; not assigned to a woodland suitability subclass.

RtB—Rotamer loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on the upper side slopes of drumlins and glacial uplands. Slopes are convex. Individual areas are long and semiround and range from 3 to 90 acres in size.

Typically, the surface layer is very dark brown loam about 9 inches thick. The subsoil is clay loam about 10 inches thick. The upper part is brown, and the lower part is dark brown. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In some areas the surface layer is silt loam. In others it is very dark gray.

Included with this soil in mapping are small areas of Kidder, Lamartine, and Theresa soils. These soils make up 2 to 20 percent of the unit. The well drained and moderately well drained Kidder soils have a thicker subsoil than this Rotamer soil. The somewhat poorly drained Lamartine soils are below the Rotamer soil on the landscape and have a thicker subsoil. The well drained Theresa soils have a thin silty mantle, which is generally lacking in Rotamer soils. Also included are areas of Rotamer soils that have a seasonally perched water table at a depth of 30 to 60 inches.

Water and air move through this soil at a moderate rate. Surface runoff is moderate, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content also is moderate, and natural fertility is medium.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and good potential for hay and pasture and for growing trees. The potential for some engineering uses is good and for others is poor.

This soil is moderately well suited to growing corn, soybeans, and small grain. It is well suited to growing grasses and legumes for hay and pasture. Minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to reduce soil loss through erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is well suited to building site development. It is poorly suited to most methods of onsite waste disposal but is well suited as a septic tank absorption field. It is poorly suited as a site for trench-type sanitary landfills and for sewage lagoons because of seepage. The suitability for these uses can be improved, however, by sealing the bottom and sides of lagoons and excavations with impervious material. Capability subclass IIe; woodland suitability subclass 2o.

RtC2—Rotamer loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on side slopes of drumlins and glacial uplands. Slopes are convex. Individual areas are irregularly shaped or long and narrow and range from 2 to 120 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is clay loam about 8 inches thick. The upper part is brown, and the lower part is dark brown. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In some small areas the surface layer is silt loam or sandy loam. In others depth to the substratum is less than 12 inches. In uneroded areas the surface layer is thicker and more friable.

Included with this soil in mapping are small areas of Kidder, Lamartine, McHenry, and Theresa soils. These soils make up 5 to 20 percent of the unit. The well drained and moderately well drained Kidder soils have a thicker subsoil than this Rotamer soil. The somewhat poorly drained Lamartine soils are lower on the landscape than this Rotamer soil and have a silty mantle and a thicker subsoil. The well drained McHenry and Theresa soils also have a thicker subsoil and have a silty mantle. Also included are areas of Rotamer soils that have a seasonally perched water table at a depth of 30 to 60 inches.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content also is moderate, and natural fertility is medium. Crusting can be a problem.

Most areas are farmed. Some are in woodland or grass. This soil has fair potential for growing cultivated crops and good potential for growing grasses and legumes for hay and pasture and for growing trees. The potential for some engineering uses is fair and for others is poor.

This soil is moderately well suited to growing corn, soybeans, and small grain. It is well suited to growing grasses and legumes for hay and pasture. The erosion hazard is severe. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control erosion and conserve moisture. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving organic-matter content, tilth, fertility, and water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from bushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential and low strength in the subsoil and the sloping topography. Placing footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope helps to make the soil more manageable.

This soil is poorly suited to most methods of onsite waste disposal but is moderately well suited as a septic tank absorption field. Proper placement of absorption fields and slope modification during construction reduce the limitation imposed by slope. The soil is poorly suited as a site for sewage lagoons and trench-type sanitary landfills. The bottom and sides of excavations can be sealed with a blanket of finer textured soil. Regrading helps to minimize the limitation imposed by slope. Capability subclass IIIe; woodland suitability subclass 2o.

RtD2—Rotamer loam, 12 to 20 percent slopes, eroded. This moderately steep, well drained soil is on the lower sides of drumlins. Slopes are convex. Individual areas are long and narrow and range from 5 to 70 acres in size.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is sandy clay loam about 6 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In most places the surface layer is mixed with the subsoil. In areas where erosion has been severe, the surface layer is sandy clay loam. In some areas the solum is less than 12 inches thick.

Included with this soil in mapping are small areas of the well drained and moderately well drained Kidder soils and the well drained Theresa soils. These soils make up 2 to 10 percent of the unit. The Kidder soils are deeper over the underlying gravelly sandy loam than this Rotamer soil. The Theresa soils have a thick silty mantle and a thicker subsoil than the Rotamer soil. Also included are areas of Rotamer soils that have a seasonally perched water table at a depth of 30 to 60 inches and areas where water seeps to the surface.

Water and air move through the subsoil of this soil at a moderate rate, and available water capacity is moderate. Runoff is rapid. This soil is more difficult to work than uneroded soils because the subsoil is mixed with the surface layer in most areas. Organic-matter content is moderate in the surface layer. Natural fertility is medium.

Some areas are farmed, some are used for woodland or pasture, and others are used for wildlife habitat. This soil has poor potential for cultivated crops and fair potential for growing grasses and legumes for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

This soil is poorly suited to growing corn and small grain. It is moderately well suited to growing grasses and legumes for hay and pasture. The hazard of water erosion is severe. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to reduce further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving tilth, fertility, and water infiltration and by reducing crusting. If cultivated crops are planted, reduced seeding rates help to conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction and excessive runoff and reduces tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The soil-related problems of forest management are the moderately steep slope and the encroachment of brush following harvest. Planting trees on the contour and carefully locating skid roads during harvest minimize erosion and improve trafficability for equipment. Seedling survival on the steeper slopes facing south or west can be improved by care in planting and by selection of vigorous planting stock. Suitable herbicides provide effective control of the brush competing with regeneration following harvest. The brush can be removed mechanically if it is a problem. Skidding can expose sufficient mineral soil to allow adequate regeneration.

This soil is poorly suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the moderately steep slopes. Placing footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope helps to make the soil more manageable.

This soil is poorly suited to onsite waste disposal. Regrading the site for a septic tank absorption field and properly placing the absorption field are beneficial. Care in the placement and alinement of absorption fields helps to overcome the limitation imposed by slope and reduces the risk of effluent surfacing on the downslope side of the field. This soil is poorly suited as a site for sewage lagoons or sanitary landfills. The suitability for these uses can be improved, however, if the bottom and sides of excavations are lined with a seal blanket of finer textured soil. Extensive movement of earth in the preparation of sites is needed because slopes are moderately steep. Some regrading can be accomplished. Regrading minimizes the limitation imposed by slope and aids in the overall use of the site. Capability subclass IVe; woodland suitability subclass 2r.

RtE2—Rotamer loam, 20 to 30 percent slopes, eroded. This steep, well drained soil is on the lower sides of drumlins. Slopes are convex. Individual areas are long and narrow and range from 4 to 50 acres in size.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is sandy clay loam about 6 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In cultivated areas the surface layer is mixed with the upper part of the subsoil. In areas where erosion has been severe, it is sandy clay loam. In some small areas the solum is less than 12 inches thick.

Included with this soil in mapping are small areas of Kidder, Lamartine, and Theresa soils. These soils make up 2 to 15 percent of the unit. The well drained and moderately well drained Kidder soils have a thicker subsoil than this Rotamer soil. The somewhat poorly drained Lamartine soils and the well drained Theresa soils also have a thicker subsoil and have a silty mantle. Also included are areas where water seeps to the surface.

Water and air move through the subsoil of this soil at a moderate rate, and available water capacity is moderate. Runoff is rapid. Eroded areas of this soil are difficult to work because of mixing of the subsoil with the surface layer. Organic-matter content is moderate in the surface layer. Natural fertility is medium.

Most areas are in woodland. A few areas are cultivated or planted to grass. Other areas are used for wildlife habitat. This soil has poor potential for cultivated crops and fair potential for grasses and legumes for hay and

pasture. It has good potential for growing trees and poor potential for most engineering uses.

This soil is moderately well suited to growing grasses and legumes. It is suited to pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The soil-related problems of forest management are the steep slope and the encroachment of brush following harvest. Planting trees on the contour and carefully locating skid roads during harvest minimize erosion and improve trafficability for equipment. Seedling survival on the steeper slopes facing south or west can be improved by care in planting and by selection of vigorous planting stock. Suitable herbicides provide effective control of the brush competing with regeneration after harvest. The brush can be removed mechanically if it is a problem. Skidding can expose sufficient mineral soil to allow adequate regeneration.

This soil is poorly suited to building site development because of the steep slope. Regrading sites to a more gentle slope is difficult, but it can help to make the soil more manageable. This soil is poorly suited to onsite waste disposal because of the steep slope and the moderate permeability. Capability subclass VIe; woodland suitability subclass 2r.

SbA—St. Charles silt loam, moderately well drained, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on till plains. Slopes are plane or slightly convex. Individual areas are semiround and range from 5 to 90 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is dark brown silt loam and dark yellowish brown silty clay loam; the middle part is dark yellowish brown, mottled silty clay loam; and the lower part is yellowish brown, mottled loam. The substratum to a depth of about 60 inches is yellowish brown sandy loam. In some small areas the silty mantle is more than 60 inches thick. A few areas are well drained.

Included with this soil in mapping are small areas of Dodge, Fox, and Virgil soils. These soils make up 2 to 15 percent of the unit. The well drained Dodge and Fox soils have a thinner silty mantle than this St. Charles soil. The Fox soils are underlain by sand and gravel. The somewhat poorly drained Virgil soils formed in material similar to that in which the St. Charles soil formed but have a darker colored surface layer.

Water and air move through this soil at a moderate rate. Surface runoff is slow. Available water capacity is high. Organic-matter content is moderate, and natural fertility is high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is at a depth of more than 3 feet.

Most areas are farmed. Some are in grass. This soil has very good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees. The potential for some engineering uses is fair and for others is poor.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage and the return of crop residue to the soil, or the regular addition of other organic material, improve fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the seasonal high water table and the low strength in the subsoil. The suitability for this use can be improved by special care in the design and placement of footings and by tile drainage.

This soil is poorly suited to most kinds of onsite waste disposal. It is only moderately well suited as a site for sewage lagoons because of the seasonal high water table and the moderate permeability in the substratum. Lowering the water table is helpful. Lining the sides and bottom of the lagoon with subsoil material reduces seepage. The soil is poorly suited as a septic tank absorption field because of the seasonal high water table. The suitability for this use can be improved, however, by building a filtering mound of suitable material. The soil is poorly suited as a site for trench-type sanitary landfills. Tile drains can be used to lower the water table. As a result of the moderate permeability in the substratum, the bottom and sides of the trench should be sealed with a blanket of the finer textured subsoil material. Capability class I; woodland suitability subclass 2o.

SbB—St. Charles silt loam, moderately well drained, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on till plains. Slopes are convex. Individual areas are long and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is dark brown silt loam and dark yellowish brown silty clay loam; the middle part is yellowish brown, mottled silty clay loam and silt loam; and the lower part is yellowish brown, mottled loam. The substratum to a depth of 60 inches is yellowish brown sandy loam. Some small areas are well drained. In a few areas the silty mantle is less than 40 inches thick. In eroded areas the surface layer is brown, tilth is poorer, and tillage is more difficult.

Included with this soil in mapping are small areas of the well drained Dodge and Theresa soils and the somewhat poorly drained Virgil soils. These soils make up 5 to 15 percent of the unit. The Dodge and Theresa soils have a thinner silty mantle than this St. Charles soil and are shallower to gravelly sandy loam glacial till. Also, the subsoil in Theresa soils is neutral in reaction. The Virgil soils have a darker colored surface layer than the St. Charles soil.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is at a depth of more than 3 feet.

Most areas are farmed. This soil has very good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees and has fair potential for some engineering uses and poor potential for others.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terraces, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, mulch tillage, and the regular addition of other organic material improve fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development and to most kinds of onsite waste disposal because of the seasonal high water table, the low strength in the subsoil, and the moderate permeability. Tile drainage that lowers the water table and special care in the design and placement of footings help to overcome these limitations.

This soil is moderately well suited as a site for trench-type sanitary landfills and for sewage lagoons. The moderate permeability can be overcome if a seal blanket of finer textured soil material is placed on the bottom and sides of the excavation and compacted. The soil is poorly suited as a site for septic tank absorption fields. The suitability for this use can be improved, however, by building a filtering mound of suitable material. In places the water table can be lowered by properly placed tile drains. Capability subclass IIe; woodland suitability subclass 2o.

SfB—St. Charles silt loam, moderately well drained, gravelly substratum, 2 to 6 percent slopes. This gently sloping moderately well drained soil is on stream terraces and outwash plains. Slopes are convex. Individual areas are irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 45 inches thick. The upper part is dark brown silt loam; the middle part is dark yellowish brown, mottled silty clay loam; and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, stratified sand and gravel. In places the silty mantle is more than 60 inches thick. In some areas layers of silt or very fine sand are in the substratum. A few areas of this soil are well drained.

Included with this soil in mapping are small areas of Casco and Fox soils and the Virgil soil that has a gravelly substratum. These soils make up 5 to 20 percent of the unit. The well drained and somewhat excessively drained Casco soils are shallow over stratified gravel and sand. The well drained Fox soils have a thinner silty mantle and a thinner subsoil than this St. Charles soil. The somewhat poorly drained Virgil soil has a thicker, darker surface layer than the St. Charles soil.

Water and air move through the subsoil of the St. Charles soil at a moderate rate and through the substratum at a very rapid rate. Available water capacity is high. Organic-matter content is moderate, and natural fertility is high. The surface layer is friable. It is best tilled when fairly dry, but it can be tilled safely throughout a fairly wide range in moisture content. The seasonal high water table is at a depth of 2.5 to 3.5 feet.

Most areas are farmed. This soil has very good potential for growing cultivated crops and for legumes and grasses for hay and pasture. It has good potential for growing trees. The potential for some engineering uses is fair and for others is poor.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terraces, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, or the regular addition of other organic material, and minimum tillage improve fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development and poorly suited to onsite waste disposal because of the seasonal high water table, the low strength in the subsoil, and the very rapid permeability in the substratum. The seasonal high water table can be lowered by properly placed tile drains. The low strength in the subsoil can be overcome by footings in the substratum.

The poor suitability for trench-type sanitary landfills and sewage lagoons is the result of the very rapid permeability in the substratum and the seasonal high water table. The water table can be lowered by tile drains, but sealing the bottom and sides of excavations in the sand and gravel is very difficult. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 2o.

ShB—Salter loamy sand, 2 to 6 percent slopes. This gently sloping, well drained and moderately well drained soil is on terraces in old lake basins. Individual areas are irregular in shape and range from 2 to 65 acres in size. Slopes are convex.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is about 12 inches thick. The upper part is dark yellowish brown loamy sand, and the lower part is dark brown sandy loam. The substratum to a depth of about 60 inches is stratified coarse silt, fine sand, and very fine sand. In some small areas the surface layer is darker colored. In some areas it is sandy loam.

Included with this soil in mapping are small areas of Kibbie, Sisson, Tuscola, and Wauconda soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Kibbie soils, the well drained Sisson soils, and the moderately well drained Tuscola soils contain more clay in the subsoil than this Salter soil. The somewhat poorly drained Wauconda soils have a silty surface layer and subsoil. Also included are some small areas of this soil having a slope of 0 to 2 or 6 to 12 percent.

Water and air move through this soil at a moderate rate. Surface runoff is medium, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content is moderately low, and natural fertility is low. The seasonal high water table is at a depth of 3 to 6 feet.

Most areas are farmed. This soil has fair potential for growing cultivated crops and good potential for hay and pasture and for growing trees. It has fair potential for some engineering uses and poor potential for others.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage, contouring, contour stripcropping, grassed waterways, and diversions help to control erosion. Returning crop residue to the soil and regularly adding other organic material improve tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing and grazing when the soil is too wet cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

The well drained areas of this soil are well suited to building site development. Most of the moderately well drained areas are only moderately well suited because of the seasonal high water table. Tile drains around the foundations can reduce the wetness. These tile drains should be covered with a fiberglass blanket to prevent the entry of substratum material.

The well drained areas of this soil are moderately well suited or well suited to onsite waste disposal. The moderately well drained areas are poorly suited to most kinds of onsite waste disposal because of the seasonal high water table. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 1o.

SkB—Saylesville silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on terraces in old lake basins. It is subject to rare flooding. Individual areas are irregular in shape and range from 2 to 50 acres in size. Slopes are plane or convex.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 22 inches thick. The upper part is brown silty clay; the middle part is brown clay; and the lower part is brown silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam and light yellowish brown, stratified silt and clay. In some small areas the surface layer is darker colored. In some areas it is sandy loam or loam. Also included are some well drained areas of this soil.

Included with this soil in mapping are small areas of Del Rey, Hebron, and Martinton soils. These soils make up 5 to 15 percent of the unit. The Del Rey soils formed in material similar to that in which this Saylesville soil formed but are somewhat poorly drained. The well drained and moderately well drained Hebron soils are loamy in the upper part. The somewhat poorly drained Martinton soils have a thicker, darker surface layer than the Saylesville soil. Also included are some small areas where slopes are 0 to 2 percent.

Water and air move through this soil at a moderately slow rate. Surface runoff is moderate, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are farmed. If managed properly, this soil has very good potential for growing cultivated crops and for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Runoff is moderate because of the clayey subsoil, and erosion control is especially important. Minimum tillage, terracing, contour stripcropping, grassed waterways, and diversions help to control erosion. Returning crop residue to the soil and regularly adding other organic material improve tilth and fertility, reduce crusting, and increase the rate of water infiltration. Timeliness of tillage is also important.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods are very important in keeping the pasture and the soil in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. The competing vegetation that interferes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil generally is only moderately well suited to building site development because of low strength, a high shrink-swell potential in the subsoil, and the seasonal high water table. Special design and proper placement of footings and tile drains that lower the water table help to overcome these limitations.

This soil generally is poorly suited to onsite waste disposal because of the seasonal high water table and the moderately slow permeability. The water table can be lowered by tile drains. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 2c.

SlC2—Saylesville silty clay loam, 6 to 12 percent slopes, eroded. This sloping, moderately well drained soil is on terraces in old lake basins. Slopes are convex. Individual areas are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is brown silty clay loam about 7 inches thick. The subsoil is about 20 inches thick. The upper part is brown silty clay; the middle part is brown clay; and the lower part is brown silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled, stratified silt and clay. In a few areas of this soil, slopes are less than 6 or more than 12 percent. Some small areas are well drained. In places the surface layer is sandy loam, loam, or silt loam.

Included with this soil in mapping are small areas of Hebron and Sisson soils. These soils make up 2 to 15 percent of the unit. The well drained and moderately well drained Hebron soils are coarser textured in the surface layer and in the upper part of the subsoil than this Saylesville soil. The well drained Sisson soils are coarser textured to a depth of 60 inches.

Water and air move through this soil at a moderately slow rate. Tilth is poor. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are farmed. Some are in grass. If managed properly, this soil has very good potential for growing cultivated crops and for pasture grasses. It has good potential for growing legumes and grasses for hay and for growing trees and poor potential for most engineering uses.

If erosion is controlled, this soil is suited to growing corn, soybeans, and small grain. It is well suited to growing grasses and legumes for hay and pasture. Minimum tillage, crop rotations, contour stripcropping, terraces, diversions, and grassed waterways help to control further soil loss. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving tilth, fertility, and water infiltration and by reducing crusting. Timeliness of tillage also is helpful.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poorer tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods are very important in managing pasture.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. The competing vegetation that interferes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil generally is only moderately well suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the sloping topography. Proper design and placement of footings help to overcome these limitations. Regrading sites to a more gentle slope helps to make the soil more manageable.

This soil generally is poorly suited to onsite waste disposal because of the moderately slow permeability, the sloping topography, and the seasonal high water table. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material or by enlarging the absorption field. This soil is poorly suited as a site for trench-type sanitary landfills or for sewage lagoons because of slope and wetness. Regrading minimizes the limitation imposed by slope. Capability subclass IIIe; woodland suitability subclass 2c.

Sm—Sebewa silt loam. This nearly level, poorly drained and very poorly drained soil is in depressions in outwash plains. It is subject to frequent flooding. Slopes are slightly concave or plane. Individual areas are irregular in shape and range from 4 to 140 acres in size.

Typically, the surface layer is black silt loam about 11 inches thick. The subsoil is about 16 inches thick. The upper part is grayish brown, mottled, firm clay loam; the middle part is gray, mottled, firm loam; and the lower part is gray, friable loam. The substratum to a depth of about 60 inches is light brownish gray coarse sand. In

most drainageways and depressions, the surface layer is more than 11 inches thick. In some small areas it is loam or silty clay loam. In places it is muck as much as 16 inches thick. In some small areas thin strata of silty clay, silty clay loam, loamy sand, or sand are in the subsoil. The depth to coarse sand is less than 24 inches in places.

Included with this soil in mapping are small areas of Keowns, Matherton, Palms, and Wasepi soils. These soils make up 2 to 15 percent of the unit. The poorly drained Keowns soils and this Sebewa soil are in similar positions on the landscape. The Keowns soils are underlain by silt and very fine sand. The somewhat poorly drained Matherton soils are similar to the Sebewa soil but occupy higher positions on the landscape. The very poorly drained Palms soils have an organic layer that is 16 to 51 inches thick. They are lower on the landscape than the Sebewa soil. The somewhat poorly drained Wasepi soils contain more sand in the surface layer and subsoil than the Sebewa soil. Also, they are in higher lying positions on the landscape.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a rapid rate. Surface runoff is slow, and water ponds in some depressions for short periods. Natural fertility is medium, and organic-matter content is high. Available water capacity is moderate. The surface layer is friable and is best tilled when it is not too wet. The roots of many crops are restricted by the coarse sand below a depth of about 27 inches. The seasonal high water table, which is at the surface or within a depth of 1 foot, also restricts root growth.

Some areas are farmed, and some are used for pasture or wildlife habitat. If drained, this soil has good potential for growing cultivated crops and grasses for hay and pasture. It has poor potential for growing trees and for most engineering uses.

If adequately drained, this soil is well suited to growing corn, soybeans, and clover hay. It is moderately well suited to growing pasture grasses. If suitable outlets are available, the water table can be lowered by open ditch drains. Diversions that intercept runoff or seepage from higher lying slopes are also beneficial. The perennial plants selected for planting should be tolerant of wetness. Minimum tillage, the return of crop residue to the soil, and timeliness of tillage help to maintain or improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and ponding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. If natural regeneration is unreliable, trees generally should be planted by hand or machine on prepared ridges because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus permit natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal because of the frequent flooding and the seasonal high water table. Capability subclass IIw; woodland suitability subclass 4w.

Sn—Sebewa silt loam, clayey substratum. This nearly level, poorly drained and very poorly drained soil is in depressions in old lake basins. It is subject to frequent flooding. Slopes are slightly concave or plane. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is black silt loam about 9 inches thick. The subsurface layer is about 4 inches of very dark gray silt loam. The subsoil is about 20 inches thick. The upper part is grayish brown, mottled, firm silty clay loam, and the lower part is gray, friable loam. The upper part of the substratum is light brownish gray sand and gravel. The lower part to a depth of about 60 inches is gray, stratified silt and clay. In depressions and drainageways the surface layer is more than 9 inches thick. In some small areas it is loam or silty clay loam. In places it is muck as much as 16 inches thick. In a few places part of the subsoil formed in the underlying silt and clay.

Included with this soil in mapping are small areas of Aztalan soils, the Matherton soil that has a clayey substratum, and Milford soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Aztalan and Matherton soils are slightly higher on the landscape than this Sebewa soil. The Aztalan soils are underlain by silt and clay, and the Matherton soil formed in material similar to that in which this Sebewa soil formed. The Sebewa soil and the poorly drained and very poorly drained Milford soils occupy similar positions on the landscape. The Milford soils contain more clay in the surface layer and subsoil.

Water and air move through the subsoil of this soil at a moderate rate and through the substratum at a very slow rate. Surface runoff is slow, and water ponds in some depressions for short periods. Natural fertility is medium, and organic-matter content is high. Available water capacity is moderate. The surface layer is friable and is best tilled when not too wet. The roots of many crops are restricted by the sand and gravel below a depth of about 33 inches. The seasonal high water table is at the surface or within a depth of 1 foot.

Some areas are farmed, and some are used for pasture or wildlife habitat. If drained, this soil has good potential for growing cultivated crops and hay. It has fair potential for growing pasture grasses and poor potential for growing trees and for most engineering uses.

If adequately drained, this soil is well suited to growing corn, soybeans, and clover hay. It is moderately well suited to growing pasture grasses. Drainage, which is difficult to attain, is necessary for dependable crop produc-

tion. Closely spaced open ditches or tile can be used for drainage. Unprotected tile should not be installed in the loose sand substratum. The perennial plants selected for establishment should be tolerant of wetness. Minimum tillage, the return of crop residue to the soil, and timeliness of tillage help to maintain or improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and ponding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and the pasture in good condition.

This soil is poorly suited to woodland. Trees grow slowly and have poor form. If natural regeneration is unreliable, the trees generally should be planted by hand or machine on prepared ridges because the soil is wet. Large, vigorous nursery stock is essential to avoid mortality. Harvesting is frequently limited to periods when the ground is frozen. Clear-cut or group-selection harvest methods reduce the danger of windthrow of the remaining trees. Suitable herbicides or mechanical removal can control competing vegetation and thus permit natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal because of the flooding, the seasonal high water table, and the very slow permeability in the substratum. Capability subclass IIw; woodland suitability subclass 4w.

SoB—Sisson fine sandy loam, 1 to 6 percent slopes. This nearly level and gently sloping, well drained soil is on terraces in old lake basins. Individual areas are irregular in shape and range from 2 to 55 acres in size. Slopes are convex.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is brown loam; the middle part is dark yellowish brown silty clay loam; and the lower part is dark yellowish brown fine sandy loam. The substratum to a depth of about 60 inches is stratified coarse silt and very fine sand. In some small areas the surface layer is silt loam.

Included with this soil in mapping are small areas of Grays, Kibbie, Tuscola, and Wauconda soils. These soils make up 5 to 15 percent of the unit. The well drained and moderately well drained Grays soils have a silty surface layer and subsoil. The moderately well drained Tuscola soils and the somewhat poorly drained Kibbie soils formed in material similar to that in which this Sisson soil formed. The somewhat poorly drained Wauconda soils are lower on the landscape than the Sisson soil. They have a silty surface layer and subsoil.

Water and air move through this soil at a moderate rate. Surface runoff is moderate, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium.

Most areas are farmed. This soil has good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has good potential for growing trees and for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The fine sandy loam surface layer is easily eroded and is subject to blowing. Minimum tillage, contouring, contour stripcropping, grassed waterways, windbreaks, and diversions help to control erosion and soil blowing. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and ponding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is moderately well suited to building site development. It is well suited to most kinds of onsite waste disposal but is only moderately well suited as a site for sewage lagoons because of seepage. A layer of a finer textured soil on the sides and bottom of the lagoon helps to reduce seepage. This soil is well suited as a site for trench-type sanitary landfills and for septic tank absorption fields. Septic tank absorption fields function best if installed in the more stable subsoil rather than in the substratum. Capability subclass IIe; woodland suitability subclass 1o.

SoC2—Sisson fine sandy loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on terraces in old lake basins. Individual areas are irregular in shape and range from 2 to 40 acres in size. Slopes are convex.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsoil is about 18 inches thick. The upper part is brown loam; the middle part is dark yellowish brown silty clay loam; and the lower part is dark yellowish brown fine sandy loam. The substratum to a depth of about 60 inches is stratified coarse silt and very fine sand. In some small areas the surface layer is silt loam.

Included with this soil in mapping are Grays and Salter soils. These soils make up 5 to 15 percent of the unit. The well drained and moderately well drained Grays soils have a silty surface layer and subsoil. The well drained and moderately well drained Salter soils have a sandy surface layer and a sandy and loamy subsoil.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium.

Most areas are farmed. If adequately protected against erosion, this soil has fair potential for growing cultivated

crops and good potential for hay and pasture. It has good potential for growing trees and fair potential for most enginering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The erosion hazard is severe. The soil is subject to soil blowing. Minimum tillage, contouring, contour stripcropping, grassed waterways, diversions, and windbreaks help to control erosion and soil blowing. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility and increase the rate of water infiltration.

If overgrazed or grazed when the soil is too wet, pasture is destroyed by trampling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because it is sloping. Regrading limited areas can be beneficial. The soil generally is only moderately well suited to onsite waste disposal because of the slope. Slopes can be reduced by regrading. Because of the unstable coarse silt and very fine sand below a depth of about 26 inches, managing this soil is difficult. Septic tank absorption fields function best if installed in the more stable subsoil. Capability subclass IIIe; woodland suitability subclass 1o.

ThB—Theresa silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on till plains and drumlins. Slopes are plane or convex. Individual areas are narrow or irregularly shaped and range from 2 to 120 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is brown silt loam and dark yellowish brown, firm silty clay loam; the middle part is brown, firm clay loam; and the lower part is yellowish brown loam. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In some small areas this soil has a silty mantle more than 22 inches thick and a solum more than 40 inches thick.

Included with this soil in mapping are small areas of Kidder, Mayville, McHenry, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The well drained and moderately well drained Kidder soils lack the silty mantle characteristic of this Theresa soil. The moderately well drained Mayville soils have a water table at a depth of 3 to 5 feet. The well drained McHenry soils and the Theresa soil formed in similar material, but the substratum of the McHenry soils has a lower calcium carbonate equivalent. The well drained Rotamer soils lack the silty mantle characteristic of the Theresa soil and are shallower to the substratum. The Theresa soil and all three of these included soils occupy similar positions on the landscape. Also included are some areas where this Theresa soil has a perched water table at a depth of 24 to 40 inches.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are farmed. Some are in woodland or are used for wildlife habitat. This soil has good potential for growing trees and cultivated crops and very good potential for hay and pasture. It has good to poor potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Terraces, minimum tillage, contouring, contour stripcropping, diversions, and grassed waterways help to control erosion. The return of crop residue to the soil, or the regular addition of other organic material, and minimum tillage improve tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil generally is only moderately well suited to building site development because of the shrink-swell potential and low strength in the subsoil. The limitations in the subsoil can be avoided by placing footings in the more stable substratum.

This soil is well suited as a site for septic tank absorption fields and trench-type sanitary landfills. It is poorly suited to sewage lagoons because of seepage and slope. The suitability for sewage lagoons can be improved by sealing the bottom and sides of excavations with the more clayey subsoil material. Capability subclass IIe; woodland suitability subclass 1o.

ThC2—Theresa silt loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on till plains and drumlins. Slopes are convex. Individual areas are long and narrow and range from 2 to 60 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 19 inches thick. The upper part is dark yellowish brown, firm silty clay loam, and the lower part is brown, firm clay loam. The substratum to a depth of about 60 inches is light yellowish brown gravelly sandy loam. In some small areas this soil has a silty mantle that is more than 20 inches thick.

Included with this soil in mapping are small areas of Kidder, McHenry, and Rotamer soils. These soils make up 2 to 15 percent of the unit. The well drained and moderately well drained Kidder soils lack the silty mantle characteristic of this Theresa soil. The well drained McHenry soils formed in material similar to that in which the Theresa soil formed, but the substratum has a lower calcium carbonate equivalent. The well drained Rotamer soils also lack the silty mantle and are shallower to the gravelly sandy loam substratum. The Theresa soil and the Kidder and McHenry soils occupy similar positions on the landscape. The Rotamer soils are below areas of the Theresa soil. Also included are some areas where this soil has a perched water table at a depth of 24 to 48 inches.

Water and air move through this soil at a moderate rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium.

Most areas are farmed. Some are in woodland or are used for wildlife habitat. This soil has fair potential for growing cultivated crops and very good potential for hay and pasture. It has good potential for growing trees and fair or poor potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control further soil loss and conserve moisture. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving tilth, fertility, and water infiltration and by reducing crusting.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is only moderately well suited to building site development because of the shrink-swell potential, the low strength in the subsoil, and the sloping topography. Placing footings in the more stable substratum is beneficial. Regrading sites to a more gentle slope helps to make the soil more manageable.

This soil is suited to most kinds of onsite waste disposal. Proper placement of septic tank absorption fields and slope modification during construction help to reduce the limitation imposed by slope. This soil is poorly suited as a site for sewage lagoons and moderately well suited as a site for trench-type sanitary landfills. Seepage can be reduced if the bottom and sides of excavations are lined with a finer textured soil. Capability subclass IIIe; woodland suitability subclass 1o.

TuA—Tuscola silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on terraces in old lake basins. Slopes are slightly convex or plane. Individual areas are semiround and range from 2 to 15 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, dark yellowish brown, and brown loam; the middle part is yellowish brown, mottled clay loam; and the lower part is yellowish brown, mottled fine sandy loam. The substratum to a depth of about 60 inches is pinkish gray and pale brown, stratified coarse silt, fine sand, and very fine sand. In a few areas the surface layer is thicker and darker colored. In other small areas of this soil, stratified gravelly sand is at a depth of 4 to 5 feet. In a few areas the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Keowns, Kibbie, and Sisson soils. The poorly drained Keowns soils, which formed in material similar to that in which this Tuscola soil formed, and the somewhat poorly drained Kibbie soils are lower on the landscape than this soil. The well drained Sisson soils are similar to this soil but are higher on the landscape.

Water moves through this soil at a moderate rate. Surface runoff is slow. Organic-matter content is moderate, and natural fertility is medium. Available water capacity is high. The surface layer is friable unless it is tilled when fairly wet. The roots of many crops are restricted by the stratified silt, fine sand, and very fine sand below a depth of about 32 inches. The seasonal high water table, which is at a depth of 2.0 to 3.5 feet, also restricts root growth.

Most areas are farmed. Some remain in woodland, and some are used for pasture or wildlife habitat. This soil has very good potential for cultivated crops and good potential for growing grasses for hay and pasture and for growing trees. It has poor potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, small grain, legumes, and other cultivated crops. It is well suited to growing grasses for pasture. Diversions and grassed waterways intercept runoff or seepage from adjoining slopes. Perennial plants selected for planting should be somewhat tolerant of wetness. Cover crops, additions of organic matter, the return of crop residue to the soil, a mulch of crop residue, and minimum tillage help to maintain tilth, permeability, and organic-matter content.

If pasture is overgrazed or grazed when the soil is too wet, the grass is trampled and tilth is destroyed. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can

be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table and the low strength in the subsoil. The low strength can be overcome by replacing the soil with suitable subbase material. The seasonal water table can be lowered by tile drains. The tile should be protected with a filter blanket to prevent the entry of substratum material. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability class I; woodland suitability subclass 1o.

TuB—Tuscola silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on terraces in old lake basins. Individual areas are oblong and range from 2 to 32 acres in size. Slopes are convex.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 19 inches thick. The upper part is dark yellowish brown loam; the middle part is brown, mottled loam; and the lower part is brown, mottled clay loam. The substratum to a depth of about 60 inches is pinkish gray and pale brown, stratified coarse silt and very fine sand. In some small areas the surface layer is dark colored.

Included with this soil in mapping are small areas of Fox, Kibbie, and Sisson soils. These soils make up 5 to 15 percent of the unit. The well drained Fox soils are underlain by gravelly sand. The somewhat poorly drained Kibbie soils, the well drained Sisson soils, and this Tuscola soil formed in similar material. The Kibbie soils are lower on the landscape than the Tuscola soil. The Sisson soils are higher on the landscape. Also included are some small areas where the slope is 0 to 2 percent.

Water and air move through this soil at a moderate rate. Surface runoff is medium, and water concentrates in downslope drainageways. Available water capacity is high. Organic-matter content is moderate, and natural fertility is medium. The seasonal high water table is at a depth of 2.0 to 3.5 feet.

Most areas are farmed. This soil has good potential for growing cultivated crops, for hay and pasture, and for growing trees. It has poor potential for most engineering uses.

This soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Minimum tillage, terraces, contour stripcropping, grassed waterways, and diversions help to control erosion. Returning crop residue to the soil and regularly adding other organic material improve tilth and fertility, reduce crusting, and increase the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development because of the low strength of the subsoil and the seasonal high water table. Special design and proper placement of footings minimize the low strength in the subsoil. Foundation drains that are protected by a filter blanket reduce the wetness.

This soil is poorly suited to onsite waste disposal because of the seasonal high water table. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 1o.

Ud—Udorthents. These nearly level and gently sloping, dominantly well drained soils are in filled and smoothed areas. The fill varies in texture but is mainly loamy. Most areas are square or rectangular and range from 3 to several hundred acres in size.

Included with these soils in mapping are some areas where the fill contains cinders, broken concrete, and industrial waste.

Available water capacity, organic-matter content, and natural fertility vary. Permeability is dominantly slow or very slow, but it also varies.

Most areas of Udorthents are in or near urban centers, especially in downtown business and industrial areas and around shopping centers. Not assigned to a capability unit or woodland suitability subclass.

VrB—Virgil silt loam, 2 to 6 percent slopes. This gently sloping, somewhat poorly drained soil is on till plains. Individual areas are irregularly shaped or long and range from 5 to 80 acres in size. Slopes are plane or slightly concave.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 2 inches thick. The subsoil is about 38 inches thick. The upper part is dark brown and light olive brown, mottled silty clay loam; the middle part is grayish brown, mottled silt loam; and the lower part is grayish brown, mottled loam. The substratum to a depth of about 60 inches is light olive brown, mottled sandy loam. In some areas this soil has a lighter colored surface layer or contains more sand and less silt in the surface layer and subsoil.

Included with this soil in mapping are small areas of Lamartine, Mayville, St. Charles, and Wacousta soils. The somewhat poorly drained Lamartine soils have a thinner silty mantle than this Virgil soil and are shallower to the sandy loam substratum. The moderately well drained Mayville soils also have a thinner silty mantle. The moderately well drained St. Charles soils are similar to the Virgil soil but have a lighter colored surface layer. The poorly drained and very poorly drained Wacousta soils are lower on the landscape than the Virgil soil and are underlain by silty material.

Water and air move through this soil at a moderate or moderately slow rate. Surface runoff is medium. Available water capacity is high. Organic-matter content and natural fertility also are high. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas are farmed. A small acreage is woodland or is in grass. If drained, this soil has very good potential for growing cultivated crops and for grasses and legumes for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is very well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, diversions, waterways, open ditches, and tile drains can effectively remove excess water. Timeliness of tillage helps to maintain tilth. Returning crop residue to the soil, or regularly adding other organic material, and occasionally plowing under a green manure crop also help to maintain tilth and fertility. Diversions that intercept runoff from adjoining slopes (fig. 4) and contouring help to control erosion.

Overgrazing or grazing when the soil is too wet causes surface compaction, ponding, and puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. Control of grazing is important because the soil is naturally wet and the silty surface layer puddles easily.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table and the low strength in the subsoil. Building sites can be improved if the water table is lowered by tile drains and footings are properly designed for the correct size and are placed in the more stable substratum. The seasonal high water table is too high for the excavation of sanitary landfill trenches and the substratum is too permeable. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 3o.

VwA—Virgil silt loam, gravelly substratum, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on stream terraces and outwash plains. It is subject to frequent flooding. Slopes are slightly convex or plane. Individual areas are long and irregularly shaped and range from 2 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 45 inches thick. The upper part is light olive brown, mottled silty clay loam, and the lower part is grayish brown sandy clay loam. The substratum to a depth of about 60 inches is light gray, stratified sand and gravel. In a few areas the surface layer is thicker and darker colored. In some areas it is thinner and lighter colored. In some small areas of this soil, layers of very fine sand and silt are in the substratum.

Included with this soil in mapping are areas of Aztalan, Fox, Matherton, Sebewa, and Wasepi soils. These soils make up 2 to 15 percent of the unit. The somewhat poorly drained Aztalan soils have a thicker surface layer than this Virgil soil and are clayey in the lower part of the subsoil and in the substratum. The well drained Fox soils are shallower to sand and gravel than the Virgil soil. The somewhat poorly drained Matherton soils also are shallower to sand and gravel and have a thinner silty mantle. The poorly drained and very poorly drained Sebewa soils are shallower over coarse sand than the Virgil soil, and the somewhat poorly drained Wasepi soils are coarser textured in the surface layer and subsoil.

Water and air move through the subsoil of this soil at a moderate to moderately slow rate and through the substratum at a very rapid rate. Surface runoff is slow. Natural fertility and organic-matter content are high. Available water capacity also is high. The surface layer is friable but cannot be tilled safely when wet. The seasonal high water table is at a depth of 1 foot to 3 feet. The roots of many crops are restricted somewhat below a depth of about 30 inches by the seasonal high water table.

Most areas are farmed. A small acreage is used for pasture or wildlife habitat. If drained, this soil has very good potential for growing cultivated crops and for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

This soil is very well suited to growing corn, soybeans, and small grain and to grasses for hay and pasture. If suitable outlets are available, the water table can be lowered by tile and open ditch drains. Also, diversions and waterways can intercept and carry away runoff or seepage from adjoining slopes. The perennial plants selected for planting should be somewhat tolerant of wetness. Minimum tillage, contouring, a mulch of crop residue, additions of other organic material, and timeliness of tillage help to control erosion, maintain or improve tilth, and increase organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to most engineering uses because of the seasonal high water table, the flooding, and the low strength in the subsoil. Building sites can be improved if the water table is lowered by drain tile and footings are properly designed for the correct size and

placed in the more stable substratum. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 3o.

Wa—Wacousta silty clay loam. This nearly level, poorly drained and very poorly drained soil is in depressions in old lake basins and between drumlins. It is subject to frequent flooding. Slopes are plane. Individual areas are long and range from 10 to 200 acres in size.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is very dark gray silty clay loam about 4 inches thick. The subsoil is olive gray, mottled silty clay loam about 6 inches thick. The substratum to a depth of about 60 inches is gray and light gray, mottled silt loam. It is stratified with thin layers of fine sandy loam in the lower part. In some areas this soil has 6 to 16 inches of silty or loamy overwash. In others it has gravelly sand or gravelly sandy loam at a depth of 48 to 60 inches.

Included with this soil in mapping are small areas of Barry, Keowns, Palms, Sebewa, and Virgil soils. These soils make up 5 to 15 percent of the unit. The poorly drained Barry soils have a thinner silty mantle and solum than this Wacousta soil and are underlain by sandy loam. The poorly drained Keowns soils contain more sand in the subsoil and substratum than the Wacousta soil. The very poorly drained Palms soils have an organic layer that is 16 to 51 inches thick. The poorly drained and very poorly drained Sebewa soils are underlain by coarse sand. The somewhat poorly drained Virgil soils have a thicker subsoil than the Wacousta soil and are underlain by sandy loam.

Water and air move through this soil at a moderately slow rate. Surface runoff is slow, and water ponds in depressions during and after heavy rains. Available water capacity is high. Organic-matter content also is high, and natural fertility is medium. The rooting depth of many plants is limited by the seasonal high water table, which is at the surface or within a depth of 1 foot.

Some areas are farmed, and some are in pasture or native vegetation. If managed properly, this soil has good potential for cultivated crops and for hay and pasture. It has poor potential for growing trees and for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If suitable outlets are available, a combination of open ditch and tile drainage effectively lowers the water table and reduces the risk of flooding. Tile is best placed at close intervals and as near the surface as design permits. Tilth and fertility can be maintained, puddling reduced, and the percolation rate increased if tillage is timely, crop residue is returned to the soil, and a green manure crop is occasionally plowed under. In areas where the surface layer is mildly alkaline or moderately alkaline, crops are subject to phosphorus deficiencies.

Overgrazing or grazing when the soil is too wet causes surface compaction, ponding, and puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. The structure of the surface layer and tilth are easily destroyed in Wacousta soils.

This soil is not naturally forested and therefore is not generally managed for woodland.

This soil is poorly suited to most engineering uses because of the moderately slow permeability, the high seasonal water table, and the flood hazard. Capability subclass IIIw; not assigned to a woodland suitability subclass.

WmA—Wasepi sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on stream terraces. It is flooded on rare occasions. Slopes are slightly concave or plane. Individual areas are long or irregularly shaped and range from 3 to 40 acres in size.

Typically, the surface layer is very dark gray sandy loam about 9 inches thick. The subsoil is about 29 inches thick. The upper part is brown, mottled, firm sandy clay loam; the middle part is brown and dark brown, mottled, friable sandy loam; and the lower part is dark brown, mottled, friable loamy sand. The substratum to a depth of about 60 inches is grayish brown sand and gravel. In some small areas the surface layer is darker colored. In others very fine sand and silt are in the substratum.

Included with this soil in mapping are areas of Boyer, Gilford, and Matherton soils. These soils make up 2 to 15 percent of the unit. The well drained Boyer soils formed in similar material above the Wasepi soil. The very poorly drained Gilford soils are underlain by sand. The somewhat poorly drained Matherton soils and this Wasepi soil occupy similar positions on the landscape. The Matherton soils have a finer textured surface layer and subsoil.

Water and air move through the subsoil of this soil at a moderately rapid rate and through the substratum at a very rapid rate. Surface runoff is slow. Natural fertility is low, and organic-matter content is moderate. Available water capacity also is moderate. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is at a depth of 1 foot to 2 feet. The roots of many crops are restricted below a depth of about 30 inches by the sand and gravel and by the seasonal high water table.

Some areas are farmed, and some remain in grasses and are used for pasture or wildlife habitat. If drained, this soil has fair potential for growing cultivated crops and for hay and pasture. It has fair potential for growing trees and poor potential for most engineering uses.

If drained, this soil is moderately well suited to growing corn, soybeans, and small grain and to grasses for hay and pasture. Artificial drainage is needed for dependable crop production. The water table can be lowered by open ditch drains. Also, diversions can intercept runoff or seepage from adjoining slopes. The perennial plants selected for planting should be somewhat tolerant of wet-

ness. Soil blowing is a hazard if the soil is drained and cultivated. Cover crops, windbreaks, a mulch of crop residue, and minimum tillage are helpful in reducing this hazard and in maintaining or improving tilth, infiltration, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to most engineering uses because of the seasonal high water table, the flooding, and the very rapid permeability in the substratum. Building sites can be improved by installing a drainage system and by providing protection against flooding. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIIw; woodland suitability subclass 3o.

WtA—Watseka Variant loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on old lake basins and on stream terraces. Slopes are plane. Individual areas are long or irregularly shaped and range from 3 to 90 acres in size.

Typically, the surface layer is black loamy sand about 12 inches thick. The subsurface layer is dark grayish brown loamy sand about 6 inches thick. The subsoil is pale brown, mottled sand about 14 inches thick. The substratum to a depth of about 60 inches is 16 inches of pale brown and light gray, mottled sand over 12 inches of light gray fine sand that has thin strata of coarse silt. In some small areas the surface layer is lighter colored.

Included with this soil in mapping are small areas of Boyer, Gilford, and Wasepi soils. These soils make up 2 to 15 percent of the unit. They have a finer textured subsoil than this Watseka soil. Also, the Boyer and Wasepi soils contain more gravel in the substratum. The well drained Boyer soils occupy higher positions on the landscape than the Watseka soil, the very poorly drained Gilford soils occupy lower positions, and the somewhat poorly drained Wasepi soils occupy similar positions.

Water and air move through this soil at a rapid rate. Surface runoff is slow. Natural fertility is low, and organic-matter content is moderate. Available water capacity is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is at a depth of 1 foot to 3 feet. The roots of many crops are sometimes restricted below a depth of about 32 inches by the seasonal high water table.

Some areas are farmed, and some remain in grasses and are used for pasture or wildlife habitat. Even if drained, this soil has poor potential for growing cultivated crops. It has fair potential for hay and pasture, fair potential for growing trees, and poor potential for most engineering uses.

Even if drained, this soil is poorly suited to growing corn, soybeans, and small grain. It is suited to growing grasses for hay and pasture. If suitable outlets are available, the water table can be lowered by open ditch drains. Also, diversions can intercept runoff or seepage from adjoining slopes. The perennial plants selected for planting should be somewhat tolerant of wetness. Soil blowing is a hazard if the soil is drained and cultivated. Cover crops, windbreaks, a mulch of crop residue, and minimum tillage are helpful in reducing this hazard. They also help to maintain tilth and organic-matter content.

Overgrazing or grazing when the soil is too wet seriously damages pasture. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. Seedling survival can be improved by careful planting of vigorous nursery stock. The competing vegetation that interferes with natural regeneration following harvest can be controlled by suitable herbicides or by mechanical removal.

This soil is poorly suited to most engineering uses because of the seasonal high water table and the rapid permeability. Building sites can be improved by drainage systems. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IVw; woodland suitability subclass 3s.

WvA—Wauconda silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on terraces in old lake basins. Slopes are plane. Individual areas are long or irregularly shaped and range from 3 to 30 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is brown, mottled silty clay loam; the middle part is grayish brown, mottled silty clay loam; and the lower part is grayish brown, mottled silt loam. The substratum to a depth of about 60 inches is light brownish gray and brownish yellow, stratified silt and fine sand. In some small areas the surface layer is thinner and lighter colored. In a few small areas stratified sand and gravel are at a depth of 4 to 5 feet. In a few areas the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of Grays, Kibbie, Keowns, Matherton, and Wacousta soils. The well drained and moderately well drained Grays soils formed in material similar to that in which this Wauconda soil formed. The somewhat poorly drained Kibbie soils contain more sand and less silt than the Wauconda soil. The poorly drained Keowns soils contain less clay in the subsoil. The somewhat poorly drained Matherton soils contain more sand in the subsoil and are underlain by

sand and gravel. The poorly drained and very poorly drained Wacousta soils contain more clay in the surface layer, have a thinner subsoil, and lack the strata of fine sand in the substratum charateristic of the Wauconda soil.

Water and air move through this soil at a moderate rate. Surface runoff is slow. Organic-matter content is high, and natural fertility is medium. Available water capacity is high. The surface layer is friable but is best tilled when fairly dry. The roots of many crops are restricted below a depth of about 36 inches by the seasonal high water table and by the underlying silt and fine sand. The seasonal high water table is at a depth of 1 foot to 3 feet.

Some areas are farmed, and some remain in grasses and are used for pasture or wildlife habitat. If drained, this soil has good potential for cultivated crops and for growing grasses for hay and pasture. It has poor potential for growing trees and for most engineering uses.

If drained, this soil is well suited to growing corn, soybeans, small grain, and other cultivated crops. It is also well suited to growing grasses and legumes for hay and pasture. If suitable outlets are available, the water table can be lowered by open ditch drains. Tile drains are most useful if they are placed entirely in the subsoil. Diversions can intercept runoff or seepage from adjoining slopes. A fiberglass blanket can protect tile drains from the entry of silt and fine sand. The perennial plants selected for planting should be somewhat tolerant of wetness. A mulch of crop residue, additions of other organic material, and minimum tillage are helpful in reducing the wetness. They also help to maintain and improve tilth, permeability, and organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, reduced percolation, and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The soil is not naturally forested and therefore is not generally managed for woodland.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table, the low strength in the subsoil, and the moderate permeability. These limitations are difficult to overcome. If the soil is used as a building site, the water table can be lowered by ditches and tile drains. Special care is needed to insure adequate size and placement of footings. Capability subclass IIw; not assigned to a woodland suitability subclass.

WvB—Wauconda silt loam, 2 to 6 percent slopes. This gently sloping, somewhat poorly drained soil is on terraces in old lake basins. Slopes are convex or concave. Individual areas are long and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is about 20 inches thick. The upper part is brown silt loam; the middle part is grayish brown, mottled silty clay loam; and the lower part is grayish brown, mottled silt loam. The substratum to a depth of about 60 inches is light brownish gray and brownish gray, mottled, stratified silt and fine sand. In some small areas the surface layer is thinner and lighter colored. In a few small areas stratified sand and gravel are at a depth of 4 to 5 feet. In a few areas the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of Grays, Juneau, and Tuscola soils. The well drained and moderately well drained Grays soils formed in material similar to that in which this Wauconda soil formed. The well drained and moderately well drained Juneau soils formed in silty alluvium on flood plains. The moderately well drained Tuscola soils contain more sand and less silt in the subsoil than the Wauconda soil.

Water and air move through this soil at a moderate rate. Surface runoff is medium. Organic-matter content is high, and natural fertility is medium. Available water capacity is high. The surface layer is friable but is best tilled when fairly dry. The roots of many crops are restricted below a depth of about 36 inches by the stratified silt and fine sand and by the seasonal high water table, which is at a depth of 1 foot to 3 feet.

Many areas are farmed. Some remain in grasses and are used for pasture or wildlife habitat. If drained, this soil has very good potential for cultivated crops and for grasses for hay and pasture. It has poor potential for growing trees and for most engineering uses.

If drained, this soil is suited to growing corn, soybeans, small grain, and other cultivated crops. It is well suited to growing grasses and legumes for hay and pasture. If suitable outlets are available, the water table can be lowered by tile and open ditch drains. Diversions can intercept runoff or seepage from adjoining slopes. Also, grassed waterways can channel the runoff. If design permits, tile should be placed in the subsoil. If the tile is placed in the substratum, a fiberglass blanket helps to prevent the entry of silt and fine sand. The perennial plants selected for planting should be somewhat tolerant of wetness. This soil is subject to erosion. Minimum tillage, contouring, a mulch of crop residue, and additions of organic matter help to control erosion, maintain and improve tilth, and increase organic-matter content.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, reduced percolation, and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is not naturally forested and therefore is not generally managed for woodland.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table and the low strength in the subsoil. These limitations are difficult to overcome. If the soil is used as a building site, the water table can be lowered somewhat by ditches and tile drains. Special care should be taken in

the design and placement of footings. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; not assigned to a woodland suitability subclass.

WxB—Whalan loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on the upper side slopes of glaciated, bedrock-controlled uplands. Slopes are convex. Individual areas are long and irregularly shaped and range from 3 to 40 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is brown loam and dark yellowish brown clay loam; the middle part is dark brown and strong brown clay loam; and the lower part is strong brown clay. The substratum is light yellowish brown, creviced dolomite. In some areas the surface layer is sandy loam or silt loam, and in some it is darker colored. In other areas the dolomite is within a depth of 20 or below a depth of 40 inches. In a few small areas the substratum is sandstone bedrock.

Included with this soil in mapping are small areas of Kidder, Lamartine, McHenry, and Theresa soils. These soils make up 5 to 20 percent of the unit. The well drained and moderately well drained Kidder soils are underlain by gravelly sandy loam. The somewhat poorly drained Lamartine soils are underlain by sandy loam glacial till and have a seasonal high water table at a depth of 1 foot to 3 feet. The well drained McHenry and Theresa soils have a thin silty mantle and are underlain by gravelly sandy loam.

Water and air move through this soil at a moderately slow rate. Surface runoff is medium, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content also is moderate, and natural fertility is medium.

Most areas are farmed. Some are in woodland. This soil has fair potential for growing cultivated crops and good potential for hay and pasture and for growing trees. It has poor potential for most engineering uses.

This soil is moderately well suited to growing corn, soybeans, and small grain. It is well suited to growing grasses and legumes for hay and pasture. Minimum tillage, contouring, contour stripcropping, grassed waterways, and diversions conserve moisture and help to control erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, reduces crusting, and increases the rate of water infiltration.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development because of the shrink-swell potential and low strength in the subsoil and the dolomite bedrock at a depth of 20 to 40 inches. The limitations in the subsoil can be avoided by placing footings on the more stable dolomite. This dolomite is hard and is not rippable in many places.

This soil is poorly suited to onsite waste disposal because hard, creviced dolomite is at a depth of 20 to 40 inches. The unfiltered effluent can move through the crevices. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIe; woodland suitability subclass 2o.

WxC2—Whalan loam, 6 to 12 percent slopes, eroded. This sloping, well drained soil is on glaciated, bedrock-controlled uplands. Slopes are convex. Individual areas are irregularly shaped and long and range from 5 to 15 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part is brown loam and dark yellowish brown clay loam; the middle part is dark brown and strong brown clay loam; and the lower part is strong brown clay. The substratum is light yellowish brown, creviced dolomite. In some small areas the surface layer is silt loam or sandy loam. In some areas it is darker colored. In other small areas the dolomite is less than 20 or more than 40 inches from the surface. In a few small areas the substratum is sandstone bedrock.

Included with this soil in mapping are small areas of Fox, Kidder, McHenry, and Rotamer soils. These soils make up 5 to 10 percent of the unit. The well drained Fox soils have a sand and gravel substratum. The well drained and moderately well drained Kidder soils have a gravelly sandy loam substratum. The well drained McHenry soils have a thin silty mantle and a gravelly sandy loam substratum. The well drained Rotamer soils have a solum that is less than 24 inches deep over gravelly sandy loam.

Water and air move through this soil at a moderately slow rate. Surface runoff is rapid, and water concentrates in downslope drainageways. Available water capacity is moderate. Organic-matter content also is moderate, and natural fertility is medium. Crusting can be a problem.

Some areas are farmed, and some are in grass or woodland. This soil has poor potential for growing cultivated crops and fair potential for grasses and legumes for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

This soil is poorly suited to growing corn, soybeans, and small grain. It is moderately well suited to growing grasses and legumes for hay and pasture. Minimum tillage, contour stripcropping, diversions, and grassed waterways help to control erosion and conserve moisture. Returning crop residue to the soil and adding other organic material help in the preparation of an adequate seedbed by improving organic-matter content, tilth, fertility, and water infiltration. Reduced seeding rates for cultivated crops conserve moisture and insure an adequate amount of water for all plants.

Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development because of the slope, the shrink-swell potential and low strength in the subsoil, and the dolomite bedrock at a depth of 20 to 40 inches. The limitations in the subsoil can be avoided by placing footings on the more stable dolomite. The dolomite is hard and is not rippable in many places.

This soil is poorly suited to onsite waste disposal because of the slope and the hard, creviced dolomite. The unfiltered effluent can move through the crevices. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIIe; woodland suitability subclass 2o.

WyA—Whalan Variant silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on terraces and foot slopes at the base of drumlins. It is flooded on rare occasions. Dolomite is near the surface. Slopes are plane or concave. Individual areas are oblong and long and range from 3 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is about 15 inches thick. The upper part is brown, mottled loam; the middle part is yellowish brown, mottled clay loam; and the lower part is dark yellowish brown, mottled clay. The substratum is light gray, creviced dolomite. In some areas the surface layer is loam, and in others it is gray. In some small areas the dolomite is 40 to 60 inches from the surface, and in others it underlies sandy loam glacial till. In a few areas this soil has as much as 12 inches of loamy overwash.

Included with this soil in mapping are small areas of Lamartine and Wacousta soils and other Whalan soils. These soils make up 5 to 15 percent of the unit. The somewhat poorly drained Lamartine soils have a thicker silty mantle than this Whalan soil, have no clayey residuum in the subsoil, and are underlain by sandy loam glacial till. The poorly drained and very poorly drained Wacousta soils also have no clayey residuum in the subsoil and are silty throughout. The well drained Whalan soils formed in material similar to that in which this Whalan soil formed.

Water and air move through this soil at a moderately slow rate. Surface runoff is slow, and water ponds in depressions during and after heavy rains. Available water capacity is moderate. Organic-matter content also is moderate, and natural fertility is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Some areas are farmed, and some are in woodland or grass. If drained, this soil has fair potential for cultivated crops and good potential for hay and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If drained, this soil is moderately well suited to growing corn, soybeans, and small grain. It is well suited to growing grasses and legumes for hay and pasture. If suitable outlets are available and the depth to dolomite is sufficient, a combination of open ditch and tile drainage effectively removes excess water. Diversions, surface drains, and grassed waterways are helpful in the many areas where drainage by tile drains is not feasible. Tilth and fertility can be maintained, puddling reduced, and the percolation rate increased if tillage is timely, crop residue is returned to the soil or other organic material is regularly added, and a green manure crop is occasionally plowed under.

Overgrazing or grazing when the soil is too wet causes surface compaction, ponding, and puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to most engineering uses because of the limited depth to dolomite and the seasonal high water table. Building sites can be improved if the water table is lowered and footings are properly placed on the underlying dolomite. The water table is too high and the bedrock too close to the surface for onsite waste disposal systems to function properly. Capability subclass IIw; woodland suitability subclass 2o.

YaA—Yahara fine sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on terraces in old lake basins. It is flooded on rare occasions. Slopes are slightly convex or plane. Individual areas are irregular in shape and range from 2 to 190 acres in size.

Typically, the surface layer is black fine sandy loam about 9 inches thick. The subsurface layer is black fine sandy loam about 6 inches thick. The subsoil is mottled fine sandy loam about 9 inches thick. The upper part is dark brown, and the lower part is brown. The substratum to a depth of about 60 inches is 12 inches of yellowish brown, mottled fine sand over 24 inches of light gray and pale brown, mottled silt and fine sand. In some areas this soil has an organic surface layer that is less than 10 inches thick. In some small areas the subsoil is finer textured. In some areas sand and gravel are at a depth of 4 to 5 feet. In places the substratum has thin layers of clay.

Included with this soil in mapping are small areas of Keowns, Kibbie, Salter, and Watseka soils. These soils make up 10 to 20 percent of the unit. The poorly drained Keowns soils and the well drained and moderately well drained Salter soils formed in material similar to that in which this Yahara soil formed. The somewhat poorly drained Kibbie soils have a thinner, lighter colored surface layer and a thicker, more distinct subsoil than this Yahara soil. The somewhat poorly drained Watseka soils have a coarser textured surface layer and subsoil than the Yahara soil and do not have layers of silt in the substratum.

Water and air move through this soil at a moderate rate. Surface runoff is slow or ponded. Available water capacity is moderate. Organic-matter content is high, and natural fertility is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is at a depth of 1 foot to 3 feet. The roots of many crops are restricted somewhat by the seasonal high water table and by free lime at a depth of about 2 feet.

Some areas are farmed, and some remain in grass and are used for pasture or wildlife habitat. If drained, this soil has fair potential for growing corn, soybeans, and small grain. It has good potential for growing grasses for hay and pasture and poor potential for growing trees and for most engineering uses.

If adequately drained and protected against flooding, this soil is moderately well suited to growing corn, soybeans, and small grain. It is well suited to growing grasses for hay and pasture and poorly suited to growing trees. If suitable outlets are available, the water table can be lowered by open ditch drains and in places by carefully placed tile drains. Diversions can intercept runoff or seepage from adjoining slopes. The substratum is unstable unless confined. Special care is needed to insure the feasibility and proper design of a drainage system. If tile is placed in the substratum, a fiberglass blanket helps to prevent the entry of silt and fine sand. The perennial plants selected for planting should be tolerant of wetness. Minimum tillage, the return of crop residue to the soil, and timeliness of tillage help to maintain tilth, permeability, and organic-matter content.

If overgrazed or grazed when the soil is too wet, pasture is trampled and destroyed. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. They are extremely important because this soil is difficult to drain.

This soil is suitable for the production of wood. The only soil-related forest management problem is competition from brushy vegetation following harvest, which can interfere with natural regeneration. This competition can be reduced by suitable herbicides or by mechanical removal of the brush.

This soil is poorly suited to building site development and onsite waste disposal because of the seasonal high water table and the flooding. Drainage systems can improve building sites. The suitability for septic tank absorption fields can be improved by building a filtering mound of suitable material. Capability subclass IIw; woodland suitability subclass 1o.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 222,085 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory, Wisconsin Conservation Needs Committee Report. Of this total, 28,900 acres was used for permanent pasture; 193,177 acres for row crops, mainly corn; 26,370 acres for close-grown crops, mainly wheat and oats; and 67,190 acres for rotation hay and pasture.

The potential of the soils in Jefferson County for increased production of food is good. About 19,742 acres of potentially good cropland is currently used as woodland and about 26,370 acres as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

The acreage in crops and pasture has gradually decreased as more and more land is used for urban development. In 1967, an estimated 56,550 acres was urban and built-up land. The use of this soil survey to help make land-use decisions that will influence the future role of farming in the county is described in the section "General soil map for broad land-use planning."

Soil erosion is the major problem on about 40 percent of the cropland and pasture in Jefferson County. If the slope is more than 2 percent, erosion is a hazard. Lamartine, Martinton, and Virgil soils, for example, have slopes of 2 to 6 percent and an additional problem of wetness.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils with a clayey subsoil, such as the Saylesville soils, and on soils with a layer in or below the subsoil that limits the depth of the root zone. Such layers include the bedrock in Whalan soils and the Whalan Variant. Erosion also reduces productivity on soils that tend to be droughty, such as Boyer and Casco soils. Second, soil erosion on farmland results in sediment entering streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

On many of the more sloping soils, preparing a good seedbed and tilling are difficult because the original friable surface soil has been eroded away and the more clayey subsoil has been plowed into the surface layer. This condition is common in the moderately eroded Casco, Fox, Griswold, Kidder, McHenry, Rotamer, Saylesville, Sisson, Theresa, and Whalan soils.

Erosion control provides protective surface cover, reduces runoff, and increases the rate of infiltration. A cropping system that keeps plant cover on the soil for extended periods can hold soil erosion losses to an amount that does not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, legume and grass forage crops in the cropping system not only provide nitrogen and improve tilth for other crops grown in the rotation but also reduce the risk of erosion.

Minimizing tillage and leaving crop residue on the surface help to increase the infiltration rate and reduce the hazards of runoff and erosion. They can be used on most soils in the survey area. The acreage of corn grown without tillage is increasing annually. No-tillage is effective in reducing the risk of erosion on sloping soils and can be successful on most soils in the survey area.

Terraces and diversions reduce the length of slopes and the risks of runoff and erosion. They are most practical on deep, well drained or moderately well drained soils that have regular slopes. Kidder, St. Charles, and Theresa soils, for example, are suitable for terracing. Other soils are less suitable for terraces and diversions because of irregular slopes, excessive wetness in the terrace channels, or bedrock within a depth of 20 inches.

Contouring and contour stripcropping are also used to control erosion in the survey area. They are best suited to soils with smooth, uniform slopes, including most areas of Dodge, McHenry, St. Charles, and Sisson soils where the slope is more than 2 percent.

Soil blowing is a hazard on the sandy Chelsea soils and the organic Adrian, Edwards, Houghton, and Palms soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Providing controlled drainage, maintaining a plant cover, surface mulching, and keeping the surface rough through proper tillage minimize the risk of soil blowing on these soils. Windbreaks of suitable trees or shrubs, such as lilac or silky dogwood, are effective in reducing the risk of soil blowing on organic soils.

Information about the design of erosion-control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on about a third of the acreage used for crops and pasture in the survey area. Some soils are naturally so wet that, unless drained, they generally cannot produce the crops commonly grown in the area. These are the poorly drained or very poorly drained Barry, Elvers, Gilford, Keowns, Milford, Otter, Sebewa, and Wacousta soils, which make up about 59,300 acres in the survey area, and the organic Adrian, Edwards, Houghton, and Palms soils, which make up about 55,250 acres.

Unless artificially drained, the somewhat poorly drained soils are so wet that crops are damaged during most years. Examples are Aztalan, Del Rey, Kibbie, Lamartine, Martinton, Matherton, Radford, Virgil, Wasepi, Wauconda, and Yahara soils; the Wateska Variant; and the Whalan Variant. These soils make up about 77,100 acres.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of the poorly drained and very poorly drained soils used intensively for row crops. The drains should be more closely spaced in the slowly permeable soils than in the more permeable soils. In most of the soils underlain with stratified silt and fine sand in lacustrine basins, special covering over the drainage tile is needed to prevent filling and clogging by substratum material.

Organic soils oxidize and subside when the pore space is filled with air; therefore, special drainage systems are needed to control the depth and the period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of organic soils. Controlled drainage can also reduce the risk of soil blowing. Information about the design of drainage systems for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally medium in the soils on uplands in the survey area. Most of the soils are naturally acid in the surface layer. The soils on flood plains, such as Juneau and Otter soils, range from medium acid to mildly alkaline in the surface layer and are naturally higher in plant nutrients than most upland soils.

On upland soils that are naturally acid or have become acid through cropping, applications of ground limestone are needed to raise the pH level sufficiently for good growth of alfalfa and other crops that grow best on nearly neutral soils. Available phosphorus and potash levels are naturally low or medium in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, the need of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Most of the soils used for crops in the survey area have a silt loam, loam, or sandy loam surface layer that is light in color and low to moderate in content of organic matter. The structure of such soils generally is weak, and a surface crust forms during periods of intense rainfall. The crust is hard when dry, and it is nearly impervious to water. Once the crust forms, it decreases the infiltration rate and increases runoff. Regular additions of crop residue, manure, and other organic material can improve soil structure and reduce the risk of crust formation.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn and, to an increasing extent, soybeans are the chief row crops. Alfalfa and oats are also common.

Specialty crops grown commercially in the survey area are vegetables, small fruits, tree fruits, and nursery plants. About 6,500 acres is used for sweet corn, green peas, potatoes, carrots and onions. About 755 acres is used for mint. Tree fruits commonly grown in the county are apples, pears, plums, and cherries. According to the 1967 Conservation Needs Inventory, about 390 acres is used for orchards, vineyards, and bush fruit.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. The Dodge, Fox, Grellton, and Kidder soils that have slopes of less than 6 percent are examples. Crops can generally be planted and harvested earlier on all these soils than on the other soils in the survey area.

If adequately drained, the organic soils in the county are suited to certain vegetable and specialty crops. Adrian, Edwards, Houghton, and Palms soils are examples.

Most of the well drained soils in the survey area are suited to orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

The latest information about growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 4. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered (*3*).

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive

varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 4.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 4 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment (*9*). The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. The capability class and subclass are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 5. All soils in the survey area except Fluvaquents; Pits, gravel; and Udorthents are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Woodland management and productivity

George W. Alley, forester, Soil Conservation Service, helped prepare this section.

Before settlement, less than half of Jefferson County was forested. The rest supported a stand of open white oak, bur oak, and red oak intermingled with tall prairie grasses. Some small areas were treeless grasslands (*5*).

After settlement, most of the acreage in the county was farmed. About 32,000 acres, or 9 percent of the land area, is currently forested. Of this acreage, about 32 percent is oak-hickory, 24 percent is maple-beech-birch, 20 percent is elm-ash-cottonwood, 12 percent is aspen-birch, 8 percent is conifers, and 4 percent is nonstocked (*12*).

Because the forested acreage is small, forestry is of limited economic importance. Small harvests of sawlogs

and pulpwood supplement the income of some landowners.

Table 6 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 7 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 7, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, or the Wisconsin Department of Natural Resources or from nurserymen.

Engineering

PEG S. WHITESIDE, soil mechanics engineer, Soil Conservation Service, helped prepare this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities. Table 11 shows the kind of limitations for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 5 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without

basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Potential frost action was not considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good, fair*, or *poor*, which, respectively, mean about the same as the terms *slight, moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil (fig. 5). Only the soil horizons between depths of 18 and 60 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal high water table can be installed, the size of the absorption field can be increased, or a filtering mound can be placed over wet or impervious soil or soil underlain by bedrock so that performance is satisfactory. These special systems are controlled by local or State ordinances, which should be consulted before construction.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear

strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 5 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 5 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor.*

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel (fig. 6). A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 5 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel or stones.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel or stones; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water-control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, natural wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

STEVE F. BAIMA, biologist, Soil Conservation Service, helped prepare this section.

Wildlife is affected by the kind of soil in its habitat. It responds to good management. Generally, the level of production of adapated wildlife is in balance with the availability of essential habitat elements, including food, cover, and water. Soils directly affect the kind and amount of introduced and native vegetation available to wildlife as food and cover. They also affect the construction of ponds and the development of wetland wildlife habitat.

Generally, several kinds of soil and a combination of land uses are needed to provide the essential elements for a species of wildlife. For this reason, the map units described in the section "General soil map for broad land-use planning" are grouped into three wildlife areas. These wildlife areas differ in the kind of wildlife species that inhabit them and in the potential for development of wildlife habitat. The true value of each wildlife area is determined by interspersion with the other areas. The diversity of wildlife is determined by the diversity of soils, land uses, and management in all of the wildlife areas. The following paragraphs describe the three wildlife areas.

Wildlife Area 1.—This wildlife area is on the Wacousta-Lamartine-Theresa, Kidder-McHenry-Rotamer, and Whalan-Kidder map units. The soils range from nearly level to steep and from well drained to somewhat poorly drained. They are silty or loamy soils, most of which are underlain by glacial till.

Dairy farming and general farm crops or specialty crops are the dominant land uses. Fall plowing on many of the soils significantly affects wildlife by covering the crop residue and waste grain that provide important food and cover in winter. Some of the steeper soils and the wet soils in drainageways and depressions remain in woodland or are used as wetland wildlife habitat. Most of the wet soils in this area are drained, however, and natural wetlands are uncommon. Although they are not numerous, the wetlands and the woodland are interspersed with the farmland. As a result, they provide the diversity required by many game and nongame species of wildlife.

The soils in this wildlife area have good potential for habitat development. Some are suitable for pond building. Hardwood trees and shrubs and cultivated crops grow well on these soils.

The major wildlife species in this area include pheasants, cottontail rabbits, squirrels, white-tailed deer, and red fox and a limited number of ducks, Wilson's snipe, and woodcock.

Wildlife Area 2.—This wildlife area is on the Fox-Casco-Matherton and Rodman-Moundville-Casco map units. The soils range from nearly level to very steep and are moderately well drained to excessively drained. They are silty and loamy soils underlain by sand and gravel outwash and sandy soils underlain by sand.

Dairy farming and general farm crops are the dominant land uses. Spring plowing in many of the cultivated areas leaves crop residue and waste grain as food and cover in winter. Many of the steeper soils and the Rodman soils remain in woodland. The soils in potholes in areas of "pitted" outwash are commonly wet. On most of these wetlands, artificial drainage is not practical, but the soils are dry in dry periods. The farm fields in this wildlife area are generally smaller than those in the other wildlife areas, and land use is more diversified. As a result of this diversity of farmland, woodland, and wetland, this area provides the habitat required for many game and nongame species of wildlife.

The soils in this wildlife area have good potential for development of wildlife habitat. Development of wetland wildlife habitat is mostly limited to blasting or dredging of existing potholes. Hardwood trees, shrubs, and cultivated crops grow well on the Fox soils. They grow less well on the Casco and Moundville soils because available water capacity is low. Available water capacity is very low in the Rodman soils, which are mostly in woodland.

The major wildlife species in this area include white-tailed deer, gray squirrels, fox squirrels, cottontail rabbits, gray fox, red fox, and raccoon.

Wildlife Area 3.—This wildlife area is on the Houghton-Adrian and Palms-Keowns-Milford map units.

It is dominantly near the major lakes, along the major drainageways, and in old glacial lake basins. The soils are nearly level, poorly drained and very poorly drained, and organic and silty.

Much of this area is drained and used for corn or specialty crops. Where drained, the farm fields are generally large and there is little diversity of land use. Artificial drainage is not practical on the wetlands that are adjacent to the major lakes and drainageways. These wetlands are used as wildlife habitat. Some are covered with water most of the year. Other undrained areas are used for pasture or marsh hay.

Wetland types 2, 3, 4, 5, and 6, which are, respectively, fresh meadows, shallow marshes, deep marshes, open water, and shrub swamps, are the most common types of wetlands (*6*). Because of the kind of soils, the topography, and the hydrologic conditions, this wildlife area provides excellent opportunities for development of wetland wildlife habitat. Much of the undrained acreage has a high value as wetland wildlife habitat.

The major wildlife species in this area include waterfowl and such fur bearers as muskrat, mink, and raccoon. Numerous nongame species, particularly birds and reptiles, are also evident in this area.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features and engineering test data.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index num-

bers in parentheses, is given in table 17. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extends a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding or ponding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table K are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on

measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table 17.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the Wisconsin Department of Transportation, Division of Highways.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials. The code for Unified classification is that assigned by the American Society for Testing and Materials.

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-69); mechanical analysis (T88-57); liquid limit (T89-60); plasticity index (T90-56); and moisture-density, method A (T99-57).

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Adrian series

The Adrian series consists of deep, very poorly drained, moderately rapidly permeable soils that formed in 16 to 51 inches of organic material accumulated mainly from sedges and are underlain by sandy deposits. These soils are in stream valleys and depressions in old glacial lake basins. Slopes range from 0 to 2 percent.

Adrian soils are commonly adjacent to Houghton soils and the Watseka Variant. Houghton soils formed in organic layers more than 51 inches thick. The Watseka Variant is somewhat poorly drained and is sandy throughout. It is higher on the landscape than Adrian soils.

Typical pedon of Adrian muck, 1,120 feet north and 400 feet west of the center of sec. 20, T. 6 N., R. 15 E.

Oap—0 to 10 inches; black (10YR 2/1) broken face and rubbed, sapric material; about 20 percent or less fibers unrubbed, less than 5 percent rubbed; weak fine granular structure; very friable; fibers primarily herbaceous; about 10 percent mineral soil material; many roots; medium acid; abrupt smooth boundary.

Oa2—10 to 14 inches; black (10YR 2/1) broken face and rubbed, sapric material; about 20 percent fibers unrubbed, less than 5 percent rubbed; weak medium subangular blocky structure; very friable; fibers primarily herbaceous; about 10 percent mineral soil material; many roots; medium acid; abrupt wavy boundary.

Oa3—14 to 26 inches; black (N 2/0) broken face and rubbed, sapric material; about 40 to 50 percent fibers unrubbed, less than 5 percent rubbed; weak coarse subangular blocky structure; friable; fibers primarily herbaceous; about 10 percent mineral soil material; few roots; slightly acid; abrupt wavy boundary.

Oa4—26 to 34 inches; black (N 2/0) broken face and rubbed, sapric material; about 40 to 50 percent fibers unrubbed, less than 5 percent rubbed; weak coarse prismatic structure parting to weak medium subangular blocky; friable; fibers primarily herbaceous; about 10 percent mineral soil material; few roots; neutral; gradual wavy boundary.

IIC—34 to 60 inches; grayish brown (10YR 5/2) medium sand; single grained; loose; strong effervescence; mildly alkaline.

The organic layer ranges from 16 to 51 inches in thickness. It is primarily sapric material. A hemic layer less than 10 inches thick occurs in some pedons. The organic layer has hue of N or 10YR, value of 2 or 3, and chroma of 0 to 2. It ranges from strongly acid to mildly alkaline. The C horizon is sand or loamy sand. It ranges from slightly acid to moderately alkaline.

Aztalan series

The Aztalan series consists of deep, somewhat poorly drained, moderately slowly permeable soils that formed in loamy material underlain by lake-laid silt and clay. These soils are on terraces in old lake basins. Slopes range from 0 to 3 percent.

Aztalan soils are commonly adjacent to Hebron soils and the Sebewa soil that has a clayey substratum. Hebron soils are well drained and moderately well drained and are higher on the landscape than Aztalan soils. The Sebewa soil is poorly drained and very poorly drained and has clay below the sandy part of the substratum.

Typical pedon of Aztalan fine sandy loam, 0 to 3 percent slopes, 1,600 feet east and 50 feet south of the northwest corner of sec. 29, T. 5 N., R. 16 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) fine sandy loam; weak very fine granular structure; very friable; neutral; abrupt smooth boundary.

B1—10 to 14 inches; dark brown (10YR 4/3) fine sandy loam; weak very fine subangular blocky structure; very friable; neutral; clear wavy boundary.

B21—14 to 19 inches; brown (10YR 5/3) sandy loam; few fine prominent strong brown (7.5YR 5/8) and few fine faint light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; very friable; neutral; clear wavy boundary.

B22t—19 to 25 inches; yellowish brown (10YR 5/4) sandy clay loam; few fine prominent strong brown (7.5YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable; common thin patchy dark brown (10YR 3/3) clay films; neutral; abrupt smooth boundary.

IIB23t—25 to 29 inches; dark brown (10YR 4/3) silty clay; common fine distinct light brownish gray (10YR 6/2) and common fine prominent brownish yellow (10YR 6/6) mottles; moderate fine prismatic structure parting to moderate very fine angular blocky; firm; thick continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; mildly alkaline; clear wavy boundary.

IIC—29 to 60 inches; light gray (10YR 6/1) and pinkish gray (7.5YR 6/2) silty clay loam; few medium prominent brownish yellow (10YR 6/6) mottles; massive; very firm; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 48 inches.

The Ap or A1 horizon is dominantly fine sandy loam, but the range includes silt loam and loam. This horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is 10 to 16 inches thick. The upper part of the B horizon is fine sandy loam, loam, sandy clay loam, or clay loam. The lower part is silty clay loam, silty clay, or clay. Both parts have hue of 10YR, 7.5YR, or 2.5Y; value of 4 to 6; and chroma of 3 to 6. The C horizon ranges from neutral to moderately alkaline. In some pedons it has lamellae of fine sand that are less than 1/2 inch thick. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 6.

Barry series

The Barry series consists of deep, poorly drained, moderately permeable soils formed in silty and loamy material underlain by sandy loam glacial till. These soils are in depressions on till plains. Slopes range from 0 to 3 percent.

These Barry soils differ from the typical Barry soils because they lack an argillic horizon, but this difference does not alter their use or behavior.

Barry soils are near Houghton, Lamartine, and Wacousta soils. Houghton soils are very poorly drained and are organic. Lamartine soils are somewhat poorly drained and are above areas of Barry soils. Wacousta soils are silty throughout the subsoil.

Typical pedon of Barry silt loam, 0 to 3 percent slopes, 675 feet north and 340 feet east of the southwest corner of sec. 22, T. 8 N., R. 15 E.

A11—0 to 11 inches; black (10YR 2/1) silt loam; moderate fine granular structure; very friable; neutral; clear smooth boundary.

A12—11 to 15 inches; very dark gray (N 3/0) silt loam; moderate very fine subangular blocky structure; friable; neutral; clear smooth boundary.

B21g—15 to 19 inches; dark grayish brown (2.5Y 4/2) loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; thin discontinuous very dark grayish brown (2.5Y 3/2) organic stains on faces of peds; neutral; clear smooth boundary.

B22g—19 to 25 inches; grayish brown (10YR 5/2) sandy clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; mildly alkaline; clear smooth boundary.

IIB3g—25 to 31 inches; grayish brown (10YR 5/2) sandy loam; common fine prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; about 2 percent coarse fragments by volume; slight effervescence; neutral; clear wavy boundary.

IIC—31 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; about 4 percent coarse fragments by volume; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 40 inches and the depth to free carbonates from 24 to 36 inches.

The A1 or Ap horizon is dominantly silt loam, but the range includes loam. The A horizon has value of 2 or 3 and chroma of 0 or 2 and ranges from 10 to 15 inches in thickness. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The upper part is loam, clay loam, or sandy clay loam, and the lower part is sandy clay loam or sandy loam. The C horizon is gravelly sandy loam or sandy loam. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is mildly alkaline or moderately alkaline.

Boyer series

The Boyer series consists of deep, well drained soils that are moderately rapidly permeable in the subsoil and very rapidly permeable in the substratum. These soils are on outwash plains. They formed in sandy and loamy deposits over sand and gravel. Slopes range from 1 to 12 percent.

Boyer soils are commonly adjacent to Casco, Fox, and Wasepi soils. Casco soils have a thinner, finer textured subsoil than Boyer soils. Fox soils have a finer textured subsoil than Boyer soils. Wasepi soils are more poorly drained than Boyer soils and are lower on the landscape.

Typical pedon of Boyer sandy loam, 1 to 6 percent slopes, 430 feet north of the center of sec. 2, T. 6 N., R. 15 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A2—9 to 15 inches; brown (10YR 5/3) sandy loam; weak thin platy structure parting to weak very fine subangular blocky; very friable; neutral; abrupt wavy boundary.

B1t—15 to 17 inches; dark brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; friable; clay bridging between sand grains; neutral; clear wavy boundary.

B21t—17 to 20 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few thin patchy dark brown (7.5YR 3/2) clay films on faces of peds; about 5 percent gravel by volume; neutral; clear wavy boundary.

B22t—20 to 24 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of peds; about 15 percent gravel by volume; neutral; clear wavy boundary.

B23t—24 to 29 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds and in root channels; about 3 percent gravel by volume; neutral; abrupt smooth boundary.

B3t—29 to 32 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; clay bridging between sand

grains; about 3 percent gravel by volume; mildy alkaline; abrupt smooth boundary.

IIC—32 to 60 inches; pale brown (10YR 6/3) stratified sand and gravel; single grain; loose; slight effervescence in the upper part, strong effervescence in the lower part; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 22 to 40 inches.

The Ap horizon is loamy sand or sandy loam and is 4 to 10 inches thick. It has color value of 3 or 4 and chroma of 2 or 3. The A2 horizon has color value of 5 or 6 and chroma of 3 or 4. It is 1 inch to 6 inches thick, or it is completely incorporated into the Ap horizon in plowed areas where erosion has been significant. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The B horizon is medium acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon has color value of 5 or 6 and chroma of 2 or 3. It is mildly alkaline or moderately alkaline.

Casco series

The Casco series consists of deep, well drained and somewhat excessively drained soils that are moderately permeable in the upper part and very rapidly permeable in the substratum. These soils are on outwash plains and terraces. They formed in loamy deposits over sand and gravel. Slopes range from 2 to 45 percent.

Casco soils are commonly adjacent to Boyer, Fox, and Rodman soils on the landscape. Boyer soils are coarser textured than Casco soils and have a thicker solum. Fox soils also have a thicker solum. Rodman soils are coarser textured than Casco soils and are shallower over the sand and gravel substratum.

Typical pedon of Casco loam, 6 to 12 percent slopes, eroded, 400 feet south and 50 feet west of the northeast corner of NW1/4 sec. 13, T. 8 N., R. 16 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

B21t—5 to 10 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 4/4) clay films on all faces of peds; about 5 percent gravel by volume; slightly acid; clear wavy boundary.

B22t—10 to 16 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; clay flows in pores and as bridges between sand grains; medium acid; clear wavy boundary.

B23t—16 to 20 inches; brown (7.5YR 5/4) sandy loam; weak and moderate fine subangular blocky structure; very friable; thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; medium acid; clear wavy boundary.

IIC—20 to 60 inches; yellowish brown (10YR 5/6) stratified sand and gravel; single grained; loose; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates are 10 to 24 inches.

The Ap horizon is dominantly loam, but the range includes sandy loam. This horizon has chroma of 2 or 3 and is 5 to 8 inches thick. The B2 horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is clay loam, sandy clay loam, or sandy loam and ranges from medium acid to mildly alkaline. The C horizon has color value of 5 or 6 and chroma of 4 to 6. It is mildly alkaline or moderately alkaline.

Chelsea series

The Chelsea series consists of deep, excessively drained, rapidly permeable sandy soils on the foot slopes of kames and pitted outwash plains. These soils formed in wind-deposited sand. Slopes range from 1 to 20 percent.

Chelsea soils are commonly adjacent to Boyer, Casco, and Moundville soils. Boyer soils have a finer textured subsoil than Chelsea soils, and Casco soils have a thinner, finer textured subsoil. Moundville soils have a thicker layer of clay accumulation in the subsoil and are moderately well drained.

Typical pedon of Chelsea loamy fine sand, 1 to 6 percent slopes, 1,200 feet south and 100 feet east of the center of sec. 26, T. 5 N., R. 16 E.

Ap—0 to 11 inches; brown (10YR 4/3) loamy fine sand; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A21—11 to 22 inches; dark yellowish brown (10YR 4/4) fine sand; weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.

A22—22 to 35 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; slightly acid; clear smooth boundary.

A&B—35 to 60 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; 1/2- to 3-inch brown (7.5YR 4/4) bands of sandy loam and loamy fine sand at 40, 45, 52, and 58 inches; slightly acid.

The thickness of sandy deposits is 60 inches or more. Depth to the uppermost lamella of B horizon material commonly is 30 inches but ranges from 27 to 48 inches.

The A1 or Ap horizon is typically loamy fine sand, but the range includes fine sand. This horizon has value of 3 or 4 and chroma of 1 to 3 and is 4 to 12 inches thick. The A21 horizon is 8 to 15 inches thick. Chroma is 3 or 4. Reaction is medium acid or slightly acid. The A part of the A&B horizon has color value of 4 to 6 and chroma of 3 to 5. The B part of this horizon occurs as lamellae that are 1/4 inch to 2 inches thick; the lamellae do not total 6 inches in thickness within a depth of 60 inches. Hue is 10YR or 7.5YR, and value and chroma are 3 or 4. The texture is sandy loam, loamy sand, or loamy fine sand. Reaction in the solum and substratum ranges from strongly acid to slightly acid.

Del Rey series

The Del Rey series consists of deep, somewhat poorly drained, slowly permeable soils that formed in silty and clayey deposits over lake-laid silt and clay. These soils are in old lake basins. Slopes range from 0 to 3 percent.

Del Rey soils are commonly adjacent to Martinton, Milford, and Saylesville soils. Martinton soils have a thicker or darker colored surface layer than Del Rey soils. Milford soils are similar to Del Rey soils but are more poorly drained and are lower on the landscape. Saylesville soils are better drained than Del Rey soils and are higher on the landscape.

Typical pedon of Del Rey silt loam, 0 to 3 percent slopes, 75 feet west and 1,200 feet north of the center of sec. 18, T. 5 N., R. 15 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, light brownish gray (2.5Y 6/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 10 inches; brown (10YR 5/3) silt loam; common medium prominent strong brown (7.5YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; moderate medium platy structure; friable; slightly acid; abrupt wavy boundary.

B21t—10 to 16 inches; grayish brown (10YR 5/2) silty clay; common medium prominent strong brown (7.5YR 5/6) mottles; moderate very fine angular blocky structure; very firm; thin patchy dark brown (7.5YR 3/2) clay films; medium acid; clear wavy boundary.

B22t—16 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; strong very fine angular blocky structure; extremely firm; thick discontinuous dark brown (7.5YR 3/2) clay films; slightly acid; clear wavy boundary.

B23t—20 to 26 inches; brown (10YR 4/3) silty clay loam; few fine prominent strong brown (7.5YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; moderate very fine angular blocky structure; extremely firm; thin patchy dark brown (7.5YR 3/2) clay films; neutral; clear wavy boundary.

C—26 to 60 inches; light gray (10YR 7/2) silty clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; moderate medium platy structure; extremely firm; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 48 inches.

The Ap horizon has color value of 3 or 4 and chroma of 1 or 2. The B horizon has hue of 10YR, 2.5Y; or 5Y, value of 4 or 5; and chroma of 1 to 4. It ranges from medium acid in the upper part to moderately alkaline in the lower part. In some pedons the C horizon has strata of fine sand, loamy fine sand, or fine sandy loam less than 1/2 inch thick. It has hue of 7.5YR, 10YR, or 2.5Y; value of 4 to 7; and chroma of 1 to 8.

Dodge series

The Dodge series consists of deep, well drained, moderately permeable soils on till plains, drumlins, and moraines. These soils formed in wind-blown silty deposits and loamy material over sandy loam glacial till. Slopes range from 2 to 6 percent.

Dodge soils are commonly adjacent to Kidder, McHenry, St. Charles, and Virgil soils. Kidder soils lack the silty mantle characteristic of Dodge soils. McHenry soils have a thinner silty mantle, and St. Charles soils have a thicker silty mantle. Virgil soils also have a thicker silty mantle and are more poorly drained.

Typical pedon of Dodge silt loam, 2 to 6 percent slopes, 1,000 feet south and 270 feet east of the northwest corner of sec. 18, T. 6 N., R. 14 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

B1t—10 to 19 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; thin patchy dark brown (7.5YR 4/4) clay films; slightly acid; clear wavy boundary.

B21t—19 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium angular blocky structure; firm; thick continuous dark brown (7.5YR 4/4) clay films; medium acid; clear wavy boundary.

B22t—25 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium subangular blocky structure; firm; thick continuous dark brown (7.5YR 4/4) clay films; strongly acid; gradual wavy boundary.

IIB3t—33 to 38 inches; strong brown (7.5YR 5/6) clay loam; moderate fine subangular blocky structure; firm; thick discontinuous dark brown (7.5YR 4/2) clay films; about 5 percent gravel; medium acid; clear wavy boundary.

IIC—38 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy loam; massive; friable; about 18 percent coarse fragments by volume; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is 4 to 10 inches thick. It has color value of 3 or 4 and chroma of 2 or 3. Typically, plowing has mixed the A2 horizon with the Ap horizon, but some pedons have an A2 horizon that is 2 to 6 inches thick. The B2t and IIB3t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The IIB3t horizon is clay loam or sandy clay loam. Reaction ranges from slightly acid to strongly acid. The C horizon has color value of 3 to 7 and chroma of 2 to 4. It is gravelly sandy loam or sandy loam. It has a calcium carbonate equivalent of 20 to 35 percent.

Edwards series

The Edwards series consists of deep, very poorly drained soils that formed in 16 to 51 inches of organic material accumulated mainly from sedges and are underlain by marl. These soils are in depressions in old lake basins. Permeability is moderately rapid in the organic layer and slow in the marl. Slopes range from 0 to 2 percent.

Edwards soils are adjacent to Adrian, Houghton, and Palms soils. Adrian soils formed in 16 to 51 inches of organic material and are underlain by sand. Houghton soils formed in more than 51 inches of organic material. Palms soils formed in 16 to 51 inches of organic material and are underlain by loamy deposits.

Typical pedon of Edwards muck, 500 feet west and 1,200 feet south of the northeast corner of sec. 7, T. 6 N., R. 14 E.

Oap—0 to 10 inches; black (N 2/0) broken face and rubbed, sapric material; weak fine granular structure; very friable; about 20 percent fibers unrubbed, less than 5 percent rubbed; neutral; abrupt smooth boundary.

Oa2—10 to 21 inches; black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed, sapric material; weak thin platy structure; about 20 percent fibers unrubbed, less than 5 percent rubbed; mildly alkaline; clear wavy boundary.

Lca1—21 to 29 inches; grayish brown (10YR 5/2) marl; massive; friable; very dark gray (10YR 3/1) organic stains; violent effervescence; mildly alkaline; clear wavy boundary.

Lca2—29 to 46 inches; light brownish gray (10YR 6/2) and grayish brown (2.5Y 5/2) marl; massive; very friable; violent effervescence; mildly alkaline; clear wavy boundary.

IIC1—46 to 49 inches; gray (N 5/0) sand; single grained; loose; violent effervescence; mildly alkaline; clear wavy boundary.

IIC2—49 to 60 inches; light olive brown (2.5Y 5/6) sand; single grained; loose; slight effervescence; mildly alkaline.

The thickness of the organic layer, or depth to marl, ranges from 16 to 51 inches. The fiber is derived primarily from herbaceous plants, such as sedges. Thin layers of hemic and fibric material are in some pedons. The organic layer ranges from medium acid to mildly alkaline. The surface tier has hue of N or 10YR and chroma of 0 to 2. The subsurface tier has hue of 10YR, 7.5YR, 5Y, or N; value of 2 or 3; and chroma of 0 to 3, broken face and rubbed. The Lca horizon has value of 5 to 8 and chroma of 1 or 2. In many pedons the marl is underlain by a layer of sand or loamy sand within a depth of 51 inches.

Elvers series

The Elvers series consists of deep, very poorly drained, moderately permeable soils formed in silty alluvium and thick deposits of muck on flood plains and stream bottoms. Slopes range from 0 to 2 percent.

These Elvers soils differ from the typical Elvers soils because they have no mottles in the mineral part of the profile, but this difference does not alter their use or behavior.

Elvers soils are near Houghton, Otter, and Virgil soils. Houghton soils are below areas of Elvers soils and lack the silty overburden of those soils. Otter soils are above areas of Elvers soils and lack the organic layer. The mineral Virgil soils are above areas of Elvers soils and are somewhat poorly drained.

Typical pedon of Elvers silt loam, 900 feet west and 550 feet south of the northeast corner of sec. 5, T. 6 N., R. 16 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

Cg—10 to 22 inches; grayish brown (10YR 5/2) silt loam; weak medium platy structure; friable; slightly acid; abrupt wavy boundary.

IIOa1—22 to 30 inches; black (N 2/0) broken face and rubbed, sapric material; about 10 percent fiber, a trace rubbed; weak fine granular structure; friable; slightly acid; gradual wavy boundary.

IIOa2—30 to 60 inches; black (10YR 2/1) broken face and rubbed, sapric material; about 10 percent fiber, a trace rubbed; weak very fine granular structure; friable; neutral.

The silty overburden ranges from 16 to 40 inches in thickness.

The Ap horizon is 7 to 10 inches thick. It has hue of 10YR or 2.5Y and chroma of 0 to 2. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 0 to 2. The silty mantle ranges from slightly acid to mildly alkaline. The Oa horizon ranges from 24 to 60 inches or more in thickness. It has hue of N or 10YR, value of 2 or 3, and chroma of 0 to 2. Reaction is slightly acid or neutral.

Fox series

The Fox series consists of deep, well drained soils that are moderately permeable in the upper part and rapidly or very rapidly permeable in the substratum. These soils are on outwash plains and terraces. They formed in silty and loamy deposits over sand and gravel. Slopes range from 0 to 12 percent.

Fox soils are commonly adjacent to Boyer, Casco, and Matherton soils on the landscape. Boyer soils have a coarser textured subsoil than Fox soils. Casco soils have a thinner solum than Fox soils. Matherton soils are somewhat poorly drained and are dominantly below the Fox soils on the landscape.

Typical pedon of Fox silt loam, 0 to 2 percent slopes, 1,500 feet south and 1,600 feet east of the northwest corner of sec. 32, T. 7 N., R. 13 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; very friable; slightly acid; abrupt smooth boundary.

B1—10 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21t—15 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few thin continuous dark brown (10YR 3/3) clay films; medium acid; clear wavy boundary.

IIB22t—21 to 29 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thick continuous very dark grayish brown (10YR 3/2) clay films; slightly acid; clear wavy boundary.

IIB3t—29 to 33 inches; brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; thin and thick patchy dark brown (7.5YR 3/2) clay films on all faces of peds; mildly alkaline; clear wavy boundary.

IIIC1—33 to 45 inches; yellowish brown (10YR 5/4) stratified sand and gravel; single grained; loose; strong effervescence; moderately alkaline; clear wavy boundary.

IIIC2—45 to 60 inches; light yellowish brown (10YR 6/4) stratified sand and gravel; single grained; loose; about 65 percent gravel by volume; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. A silty mantle as much as 24 inches thick is evident in places.

The Ap horizon is silt loam or loam and is 6 to 11 inches thick. It has chroma of 2 or 3. The B2 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 to 5. It is silty clay loam, loam, sandy clay loam, or clay loam. The B horizon ranges from strongly acid to mildly alkaline. The C horizon has value of 5 or 6 and chroma of 2 to 4.

Gilford series

The Gilford series consists of deep, very poorly drained, moderately rapidly permeable soils that formed in loamy outwash in depressions in outwash plains. Slopes range from 0 to 2 percent.

Gilford soils are commonly adjacent to Adrian, Matherton, and Wasepi soils. Adrian soils are very poorly drained, organic soils that are underlain by sand. Wasepi soils formed in material similar to that in which Gilford soils formed and are somewhat poorly drained. Matherton soils are above areas of Gilford soils and are finer textured.

Typical pedon of Gilford sandy loam, 450 feet east and 200 feet north of the center of sec. 5, T. 6 N., R. 16 E.

Ap—0 to 11 inches; black (N 2/0) sandy loam; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

B1g—11 to 16 inches; dark grayish brown (2.5Y 4/2) sandy loam; common medium distinct dark brown (7.5YR 3/2) mottles; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B2g—16 to 29 inches; grayish brown (2.5Y 5/2) sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

IIC—29 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grained; loose; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches.

The Ap horizon has hue of N or 10YR, value of 2 or 3, and chroma of 0 to 2. It ranges from 10 to 20 inches in thickness. The Bg horizon is dominantly sandy loam but has some thin subhorizons of loamy sand, loam, or sandy clay loam. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Reaction is slightly acid or neutral. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 or 2. It is as much as 15 percent gravel in some pedons.

Grays series

The Grays series consists of deep, well drained and moderately well drained, moderately permeable soils formed in silty deposits and underlain by lake-laid silt and very fine sand. These soils are on terraces in old lake basins. Slopes range from 2 to 6 percent.

Grays soils are commonly adjacent to Aztalan, Kidder, and Wauconda soils. Aztalan and Wauconda soils are somewhat poorly drained and are below Grays soils on the landscape. Kidder soils are underlain by glacial till and are above Grays soils on the landscape.

Typical pedon of Grays silt loam, 2 to 6 percent slopes, 1,250 feet west and 150 feet south of the northeast corner of sec. 36, T. 6 N., R. 13 E.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; very friable; neutral; clear wavy boundary.

A2—6 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate thin platy structure; very friable; neutral; clear wavy boundary.

B1—9 to 18 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—18 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular blocky structure; firm; thick continuous dark brown (10YR 3/3) clay films; medium acid; clear wavy boundary.

B22t—27 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium angular blocky structure; firm; thick discontinuous dark brown (10YR 3/3) clay films; slightly acid; clear wavy boundary.

B3—34 to 38 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; slight effervescence; neutral; clear wavy boundary.

IIC1—38 to 53 inches; light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) stratified very fine sand and silt; few fine faint yellowish brown (10YR 5/6) mottles; very friable; slight effervescence; mildly alkaline; diffuse irregular boundary.

IIC2—53 to 60 inches; pale brown (10YR 6/3) coarse silt; massive; very friable; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The A1 or Ap horizon is 6 to 10 inches thick. It has color value of 2 or 3 and chroma of 1 to 3. The A2 horizon has been mixed with the Ap horizon in some cultivated areas. In other areas it has value of 4 to 6 and chroma of 2 or 3. The B horizon has value of 4 or 5 and chroma of 3 to 6. It is medium acid to neutral. In many pedons it has mottles of high and low chroma in the lower part. The IIC horizon is commonly stratified silt, silt loam, very fine sand, or fine sandy loam. Reaction is mildly alkaline or moderately alkaline.

Grellton series

The Grellton series consists of deep, well drained and moderately well drained, moderately permeable soils that formed in loamy and silty deposits on till plains. These soils are on the lower part of drumlins, on moraines, and in areas between drumlins. Slopes range from 2 to 6 percent.

Grellton soils are adjacent to Kibbie, Kidder, and Lamartine soils. Kibbie soils are more poorly drained than Grellton soils and are lower on the landscape. Kidder soils have a thinner solum than Grellton soils and are higher on the landscape. Lamartine soils are below areas of Grellton soils and are silty in the upper part of the solum.

Typical pedon of Grellton fine sandy loam, 2 to 6 percent slopes, 1,200 feet west and 50 feet north of the southeast corner of sec. 25, T. 7 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak very fine granular structure; very friable; medium acid; abrupt smooth boundary.

B1—9 to 14 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.

B21—14 to 26 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; very friable; neutral; clear wavy boundary.

B22t—26 to 32 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films; neutral; clear wavy boundary.

B23t—32 to 35 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) clay films; slightly acid; gradual wavy boundary.

IIB3t—35 to 44 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films; slightly acid; clear wavy boundary.

IIC—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; common fine prominent brownish yellow (10YR 6/8) mottles; massive; friable; slightly acid.

The thickness of the solum ranges from 36 to 60 inches.

The A horizon has color value of 3 or 4 and chroma of 2 or 3. An A2 horizon is evident in areas where it has not been mixed with the Ap horizon by plowing. It is 4 to 6 inches thick. The B horizon is sandy clay loam, fine sandy loam, sandy loam, or loam. The IIB horizon is silty clay loam or silt loam. In some pedons there is a IIIB horizon of sandy loam, loam, or sandy clay loam. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is medium acid to neutral. The C horizon is silt loam, sandy loam, or gravelly sandy loam. Reaction ranges from slightly acid to moderately alkaline. If it occurs, the underlying sandy loam or gravelly sandy loam has a calcium carbonate equivalent ranging from 25 to 40 percent and has color value of 4 to 6 and chroma of 3 or 4.

Griswold series

The Griswold series consists of deep, well drained, moderately permeable soils on the middle and upper side slopes of moraines and till plains. These soils formed in loamy material and in the underlying sandy loam glacial till. Slopes range from 2 to 12 percent.

Griswold soils are adjacent to Aztalan, Kidder, and Lamartine soils. Aztalan soils are below areas of Griswold soils and are somewhat poorly drained. They are underlain by silt and clay. Kidder soils are above areas of Griswold soils. They have a thinner or lighter colored surface layer than those soils. Lamartine soils are below areas of Griswold soils and are somewhat poorly drained.

Typical pedon of Griswold sandy loam, 2 to 6 percent slopes, 50 feet south and 1,300 feet east of the northwest corner of sec. 32, T. 5 N., R. 15 E.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam; moderate very fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A12—9 to 12 inches; dark brown (10YR 3/3) sandy loam; moderate very fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

B21t—12 to 16 inches; dark brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure parting to moderate very fine subangular blocky; firm; thin discontinuous dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; slightly acid; clear wavy boundary.

B22t—16 to 21 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate fine subangular blocky structure; firm; thin continuous

dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; many earthworm casts; neutral; clear wavy boundary.

B3—21 to 25 inches; dark brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; about 5 percent gravel by volume; neutral; clear wavy boundary.

C—25 to 60 inches; yellowish brown (10YR 5/4) gravelly sandy loam; massive; friable; about 20 percent gravel by volume; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches.

The A horizon is 9 to 15 inches thick. It has color value of 2 or 3 and chroma of 1 to 3. The B horizon is sandy loam, sandy clay loam, or clay loam. It has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 5. Reaction is slightly acid or neutral. The content of gravel ranges from 5 to 10 percent. The C horizon is sandy loam or gravelly sandy loam. The gravel content is, by volume, 5 to 30 percent. Reaction is mildly alkaline or moderately alkaline. The calcium carbonate equivalent is 20 to 40 percent.

Hebron series

The Hebron series consists of deep, well drained and moderately well drained, moderately slowly permeable soils on terraces in old lake basins. These soils formed in loamy outwash and clayey material over lake-laid silt and clay. Slopes are 1 to 6 percent.

Hebron soils are commonly adjacent to Aztalan, Kidder, Martinton, and Saylesville soils. Aztalan soils are similar to Hebron soils but are more poorly drained; have a thicker, darker surface layer; and are lower on the landscape. Kidder soils are underlain by glacial till and are above areas of Hebron soils. Martinton soils are below areas of Hebron soils and are more poorly drained than those soils. They lack the loamy upper story characteristic of those soils. Saylesville soils also lack the loamy upper story.

Typical pedon of Hebron loam, 1 to 6 percent slopes, 300 feet south and 80 feet west of the northwest corner of NE1/4 sec. 14, T. 7 N., R. 14 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam light brownish gray (10YR 6/2) dry; weak fine grnaular structure; very friable; neutral; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 5/3) loam; weak very thin platy structure parting to weak very fine subangular blocky; friable; neutral; clear wavy boundary.

B1—12 to 16 inches; dark brown (7.5YR 4/4) loam; moderate very fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—16 to 21 inches; dark brown (7.5YR 4/4) loam; moderate very fine subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films; slightly acid; clear wavy boundary.

B22t—21 to 29 inches; dark brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; very firm; thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; slightly acid; clear wavy boundary.

B23t—29 to 34 inches; dark brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; firm; thick discontinuous dark brown (7.5YR 3/2) clay films; slightly acid; abrupt wavy boundary.

IIB24t—34 to 40 inches; dark yellowish brown (10YR 4/4) silty clay; common medium prominent grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; thin continuous dark yellowish brown (10YR 3/4) clay films; slight effervescence; mildly alkaline; clear wavy boundary.

IIC—40 to 60 inches; light yellowish brown (10YR 6/4) stratified silt and clay; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; white (2.5Y 8/2) accumulations of lime; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 40 inches.

The A1 or Ap horizon has color value of 3 to 5. The A2 horizon has chroma of 2 or 3 and is 2 to 6 inches thick. The upper part of the B horizon is loam, sandy clay loam, or clay loam. The lower part is silty clay loam or silty clay. The B horizon has hue of 10YR or 7.5YR and value of 4 to 6. It ranges from medium acid to mildly alkaline in the upper part and is mildly alkaline or moderately alkaline in the lower part. In some pedons the C horizon has lamellae of fine sand, loamy fine sand, or fine sand less than 1/2 inch thick. It has hue of 7.5YR or 10YR and value of 4 to 6.

Houghton series

The Houghton series consists of deep, very poorly drained, moderately rapidly permeable soils that formed in more than 51 inches of material that accumulated mainly from sedges. These soils are in depressions in old lake basins. Slopes range from 0 to 2 percent.

Houghton soils are commonly adjacent to Adrian, Keowns, and Palms soils. Adrian soils have an organic layer that is less than 51 inches deep over sandy material. Keowns soils are poorly drained, mineral soils that are underlain by lake-laid silt and very fine sand. Palms soils have an organic layer that is less than 51 inches deep over loamy material.

Typical pedon of Houghton muck, 1,100 feet west and 400 feet south of the center of sec. 27, T. 7 N., R. 16 E.

Oap—0 to 11 inches; black (N 2/0) unrubbed, black (10YR 2/1) rubbed, sapric material; about 60 percent fiber unrubbed, less than 2 percent rubbed; weak fine granular structure; very friable; fibers primarily herbaceous; about 10 percent mineral soil material; medium acid; abrupt smooth boundary.

Oa2—11 to 24 inches; very dark brown (10YR 2/2) unrubbed, black (10YR 2/1) rubbed, sapric material; about 85 percent fiber unrubbed, less than 2 percent rubbed; weak coarse prismatic structure parting to weak medium subangular blocky; very friable; fibers primarily herbaceous; about 10 to 15 percent mineral soil material; slightly acid; clear smooth boundary.

Oa3—24 to 33 inches; very dark brown (10YR 2/2) unrubbed, black (10YR 2/1) rubbed, sapric material; about 65 percent fiber unrubbed, 4 percent rubbed; weak thin platy structure; very friable; fibers primarily herbaceous; about 10 to 15 percent mineral soil material; slightly acid; abrupt smooth boundary.

Oa4—33 to 43 inches; black (10YR 2/1) broken face and rubbed, sapric material; about 7 percent fiber unrubbed, 4 percent rubbed; massive; very friable; fibers primarily herbaceous; about 10 to 15 percent mineral soil material; slightly acid; gradual wavy boundary.

Oa5—43 to 50 inches; very dark grayish brown (10YR 3/2) unrubbed, very dark gray (10YR 3/1) rubbed, sapric material; about 25 percent fiber unrubbed, less than 5 percent rubbed; massive; very friable; fibers primarily herbaceous; about 15 percent mineral soil material; neutral; gradual wavy boundary.

Oa6—50 to 72 inches; very dark gray (10YR 3/1) broken face and rubbed, sapric material; about 15 to 20 percent fiber unrubbed, less than 5 percent rubbed; weak thin platy structure; very friable; fibers primarily herbaceous; about 15 percent mineral soil material; neutral.

The organic layer is more than 51 inches thick. The surface tier is dominantly sapric material, but in some uncultivated areas a 1-inch mat of sphagnum moss or undecomposed plant remains is at the surface.

The subsurface and bottom tiers have hue of N or 10YR, value of 2 or 3, and chroma of 0 to 2. They are dominantly sapric material, but some

pedons have thin layers of hemic or fibric material. The hemic material is less than 10 inches thick, and the fibric material is less than 5 inches thick. The organic material is derived primarily from herbaceous plants, but a few woody fragments ranging from 1/8 inch to several inches in diameter are mixed throughout the control section in some pedons. Reaction in the organic material ranges from medium acid to neutral.

Some pedons have a C horizon between depths of 51 and 72 inches. This horizon ranges from sand to silty clay loam.

Juneau series

The Juneau series consists of deep, well drained and moderately well drained, moderately permeable soils that formed in recent silty alluvium over a buried silty soil. These soils are in stream valleys and drainageways. Slopes range from 1 to 6 percent.

Juneau soils are commonly adjacent to Kidder, Lamartine, and Radford soils. Kidder soils are above areas of Juneau soils. Lamartine soils are below areas of Juneau soils and lack the overburden of silty alluvium characteristic of those soils. Radford soils are similar to Juneau soils but are lower on the landscape, have a darker colored surface layer, and are somewhat poorly drained.

Typical pedon of Juneau silt loam, 1 to 6 percent slopes, 1,350 feet south and 75 feet west of the northeast corner of sec. 24, T. 6 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

C—9 to 27 inches; dark grayish brown (10YR 4/2) silt loam; weak thick platy structure; friable; slightly acid; abrupt wavy boundary.

B11b—27 to 36 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; firm; slightly acid; clear wavy boundary.

B12b—36 to 45 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films; neutral; clear wavy boundary.

B2tb—45 to 52 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films; slightly acid; clear wavy boundary.

IIB3b—52 to 60 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; friable; thin patchy dark brown (7.5YR 3/2) clay films; slightly acid.

The thickness of the recent silty alluvium ranges from 20 to less than 40 inches. The buried soil ranges from 40 to 60 inches in thickness.

The Ap and C horizons have color value of 3 to 5 and chroma of 2 or 3. The Ap horizon is 6 to 10 inches thick, and the C horizon is 14 to 30 inches thick. Typically, these horizons are slightly acid, but they range to mildly alkaline. The buried B horizon has color value of 3 to 5 and chroma of 2 to 4. The lower part of the B horizon is clay loam; sandy clay loam; or, less commonly, sandy loam. The Bb and IIBb horizons range from medium acid to mildly alkaline.

Keowns series

The Keowns series consists of deep, poorly drained, moderately permeable soils in old lake basins. These soils formed in silty and loamy deposits and are underlain by silt and very fine sand. Slopes range from 0 to 2 percent.

The Keowns soils in Jefferson County differ from the typical Keowns soils; they have a mollic epipedon, are coarse-silty, and have fewer mottles. These differences, however, do not alter the use or behavior of the soils.

Keowns soils are commonly adjacent to Kibbie, Palms, Wacousta, and Yahara soils. Kibbie soils are similar to Keowns soils but are better drained and are higher on the landscape. Palms soils are slightly lower on the landscape than Keowns soils. They formed in organic material. Wacousta soils have a silty subsoil and substratum. Yahara soils are higher on the landscape than the Keowns soils and are better drained.

Typical pedon of Keowns silt loam, 1,500 feet south and 1,300 feet west of the northeast corner of sec. 27, T. 6 N., R. 16 E.

Ap—0 to 7 inches; black (N 2/0) silt loam; weak very fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

A3—7 to 10 inches; very dark gray (10YR 3/1) fine sandy loam; weak coarse subangular blocky structure parting to weak very fine granular; friable; mildly alkaline; clear wavy boundary.

B21g—10 to 14 inches; olive gray (5Y 5/2) fine sandy loam; weak fine subangular blocky structure; friable; moderately alkaline; clear wavy boundary.

B22g—14 to 19 inches; light olive gray (5Y 6/2) silt loam; weak thick platy structure parting to moderate fine angular blocky; friable; slight effervescence; mildly alkaline; clear wavy boundary.

Cg—19 to 60 inches; light gray (5Y 7/1) stratified silt and very fine sand; massive; friable; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 15 to 30 inches.

The A horizon is 10 to 18 inches thick and has hue of N, 10YR, or 2.5Y; value of 2 or 3; and chroma of 0 to 2. It is dominantly silt loam, but the range includes fine sandy loam. The Bg horizon has hue of 2.5Y, 5Y, or 10YR; value of 4 to 7; and chroma of 1 or 2. It is silt loam, sandy loam, loam, or fine sandy loam. It is neutral to moderately alkaline. The C horizon is stratified silt, very fine sand, or fine sand. It has hue of 10YR, 2.5Y, or 5Y; value of 4 to 7; and chroma of 1 or 2. Reaction is mildly alkaline or moderately alkaline.

Kibbie series

The Kibbie series consists of deep, somewhat poorly drained, moderately permeable soils that formed in loamy deposits and are underlain by silty and sandy lake-laid deposits. These soils are in old lake basins and on outwash plains. Slopes range from 0 to 3 percent.

Kibbie soils are adjacent to Keowns, Lamartine, and Sisson soils on the landscape. Keowns soils are lower on the landscape than Kibbie soils and contain more clay in the subsoil. Lamartine soils contain more silt and less sand than Kibbie soils. Sisson soils are higher on the landscape than Kibbie soils and are better drained.

Typical pedon of Kibbie fine sandy loam, 0 to 3 percent slopes, 1,300 feet east and 50 feet north of the southwest corner of sec. 8, T. 5 N., R. 13 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine subangular blocky structure parting to weak very fine granular; very friable; neutral; abrupt smooth boundary.

B1—9 to 18 inches; brown (10YR 5/3) loam; moderate very fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—18 to 25 inches; brown (10YR 5/3) clay loam; few fine faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; thick continuous very dark grayish brown (10YR 3/2) clay films; slightly acid; clear wavy boundary.

B22t—25 to 31 inches; brown (10YR 5/3) sandy clay loam; common medium faint light brownish gray (10YR 6/2) and common medium

prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; medium patchy very dark grayish brown (10YR 3/2) clay films on all faces of peds; neutral; clear wavy boundary.

B3t—31 to 35 inches; yellowish brown (10YR 5/4) loam; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak very fine subangular blocky structure; friable; thin patchy very dark grayish brown (10YR 3/2) clay films on all faces of peds; neutral; gradual wavy boundary.

C—35 to 60 inches; variegated yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and pale brown (10YR 6/3) stratified fine sand and silt; friable; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 42 inches.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. It is 6 to 10 inches thick. It is dominantly fine sandy loam, but the range includes silt loam. The B horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, silt loam, sandy clay loam, clay loam, or sandy loam and is medium acid to neutral. In some pedons 1/4- to 3-inch strata ranging from clay to loamy sand or fine sand are in the lower part of the B horizon and in the C horizon. The C horizon has color value of 5 or 6 and chroma of 2 to 4. The strata in the C horizon range from 1/4 inch to more than 15 inches in thickness. Reaction in the C horizon is mildly alkaline or moderately alkaline.

Kidder series

The Kidder series consists of deep, well drained and moderately well drained, moderately permeable soils that formed in loamy deposits and in the underlying loamy glacial till. These soils are on till plains and drumlins. Slopes range from 2 to 20 percent.

Kidder soils are commonly adjacent to Lamartine, McHenry, Theresa, and Virgil soils. Lamartine and Virgil soils are more poorly drained than Kidder soils and are lower on the landscape. Also, they have a silty mantle. McHenry and Theresa soils also have a silty mantle.

Typical pedon of Kidder loam, 2 to 6 percent slopes, 100 feet east and 25 feet north of the northwest corner of SW1/4 sec. 22, T. 8 N., R. 15 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; moderate very fine granular structure; very friable; neutral; abrupt smooth boundary.

A2—8 to 11 inches; brown (10YR 5/3) loam; weak thin platy structure; friable; neutral; clear wavy boundary.

B21t—11 to 16 inches; dark brown (10YR 4/3) sandy clay loam; moderate fine subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films; about 5 percent gravel by volume; mildly alkaline; clear wavy boundary.

B22t—16 to 26 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate very fine subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; neutral; clear wavy boundary.

B23t—26 to 31 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; very firm; thick patchy very dark gray (N 3/0) organic stains and thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; neutral; gradual wavy boundary.

C—31 to 60 inches; pale brown (10YR 6/3) gravelly sandy loam; massive; about 20 percent gravel by volume; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is loam or sandy loam and is 6 to 10 inches thick. It has color value of 3 or 4 and chroma of 2 or 3. The A2 horizon, if it occurs, is loam or sandy loam and has color value of 4 or 5 and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR and value and chroma of 3 or 4. In moderately well drained areas, varicolored mottles are in the lower part of the B horizon. This horizon is clay loam, loam, or sandy clay loam. It is medium acid to mildly alkaline. The C horizon has color value of 5 or 6 and chroma of 3 to 6. It is sandy loam or gravelly sandy loam. It is mildly alkaline or moderately alkaline. The gravel content ranges, by volume, from 5 to 30 percent. The calcium carbonate equivalent ranges from 15 to 35 percent.

Lamartine series

The Lamartine series consists of deep, somewhat poorly drained, moderately permeable soils that formed in silty and loamy deposits over sandy loam glacial till. These soils are on the lower side slopes of ground moraines and drumlins. Slopes are 2 to 6 percent.

Lamartine soils are adjacent to Barry, Dodge, Rotamer, and Theresa soils. Barry soils are below areas of Lamartine soils and are more poorly drained. Dodge, Rotamer, and Theresa soils are above areas of Lamartine soils and are better drained. Also, Rotamer soils lack the silty mantle characteristic of Lamartine soils and have a thinner solum.

Typical pedon of Lamartine silt loam, 2 to 6 percent slopes, 100 feet west of the northeast corner of SE1/4 sec. 16, T. 8 N., R. 16 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; very friable; neutral; abrupt smooth boundary.

A2—9 to 11 inches; brown (10YR 5/3) silt loam; common fine prominent brownish yellow (10YR 6/6) mottles; weak medium platy structure; friable; neutral; abrupt smooth boundary.

B1t—11 to 14 inches; brown (10YR 5/3) silt loam; common fine prominent brownish yellow (10YR 6/6) mottles; weak very fine subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on all faces of peds; slightly acid; clear smooth boundary.

B2t—14 to 25 inches; dark brown (10YR 4/3) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate very fine subangular blocky structure; firm; thin patchy very dark grayish brown (10YR 3/2) clay films on all faces of peds; neutral; clear smooth boundary.

IIB3t—25 to 30 inches; brown (10YR 5/3) clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium prominent light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; about 2 percent gravel by volume; thick patchy very dark grayish brown (10YR 3/2) clay films on all faces of peds; neutral; clear smooth boundary.

IIC—30 to 60 inches; light yellowish brown (10YR 6/4) sandy loam; many medium prominent yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; massive; very friable; about 10 percent gravel by volume; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. The silty mantle ranges from 20 to 36 inches in thickness.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is 6 to 10 inches thick. The A2 horizon, if it occurs, has value of 4 or 5 and chroma of 2 or 3. It is as much as 5 inches thick. The B and IIB horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. They are slightly acid to mildly alkaline. The IIB horizon is sandy clay loam, clay loam, or loam. It commonly is 1 to 5 percent gravel. The C horizon is sandy loam or gravelly sandy loam and has color value of 5 or 6 and chroma of 3 to 6. It is mildly alkaline or moderately alkaline. The con-

tent of coarse fragments ranges, by volume, from 5 to 30 percent. The calcium carbonate equivalent ranges from 20 to 40 percent.

Lorenzo series

The Lorenzo series consists of deep, well drained soils that are moderately rapidly permeable in the upper part and rapidly or very rapidly permeable in the lower part. These soils formed in loamy deposits underlain by sand and gravel. They are on outwash plains. Slopes range from 2 to 6 percent.

Lorenzo soils are commonly adjacent to Casco, Chelsea, and Fox soils. Casco soils have a thinner or lighter colored surface layer than Lorenzo soils. Chelsea soils are below areas of Lorenzo soils and contain more sand and less clay in the subsoil. Fox soils are deeper to the underlying sand and gravel than Lorenzo soils and have a thinner or lighter colored surface layer.

Typical pedon of Lorenzo sandy loam, 2 to 6 percent slopes, 1,300 feet west and 1,900 feet south of the northeast corner of sec. 35, T. 5 N., R. 16 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

B1—8 to 11 inches; reddish brown (5YR 4/4) coarse sandy loam; weak fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21t—11 to 14 inches; dark reddish brown (5YR 3/4) sandy clay loam; weak fine subangular blocky structure; firm; clay bridging between sand grains; about 3 percent gravel by volume; slightly acid; clear wavy boundary.

B22t—14 to 18 inches; dark brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; medium acid; clear wavy boundary.

IIC—18 to 60 inches; yellowish brown (10YR 5/4) stratified sand and gravel; single grain; loose; about 25 percent gravel by volume; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 12 to 24 inches.

The Ap horizon is 6 to 12 inches thick. It has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. The B horizon has hue of 5YR, 10YR, or 7.5YR; value of 3 to 5; and chroma of 3 or 4. It is medium acid to neutral. It is sandy clay loam, loam, clay loam, or sandy loam. The C horizon is mildly alkaline or moderately alkaline.

Martinton series

The Martinton series consists of deep, somewhat poorly drained, slowly permeable soils. These soils formed in silty and clayey deposits over stratified silt and clay. They are on low terraces in old lake basins. Slopes range from 0 to 6 percent.

Martinton soils are adjacent to Keowns, Milford, Saylesville, and Wasepi soils. Keowns soils are below Martinton soils on the landscape and are more poorly drained. Also, they have a coarser textured subsoil. Milford soils are similar to Martinton soils but are more poorly drained and are lower on the landscape. Saylesville soils are higher on the landscape than Martinton soils and are better drained. Also, they have a thinner or lighter colored surface layer. Wasepi soils are dominantly loamy in the solum.

Typical pedon of Martinton silt loam, 0 to 2 percent slopes, 264 feet west and 55 feet south of the exact center of sec. 36, T. 8 N., R. 14 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

B21t—11 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; thick continuous dark brown (7.5YR 3/2) clay films; neutral; abrupt smooth boundary.

B22t—15 to 18 inches; light yellowish brown (10YR 6/4) silty clay; few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular and angular blocky structure; firm; thick discontinuous dark grayish brown (10YR 4/2) clay films; neutral; abrupt wavy boundary.

B23t—18 to 25 inches; very pale brown (10YR 7/4) silty clay; common fine prominent light brownish gray (10YR 6/2) mottles; moderate fine subangular and angular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on all faces of peds; neutral; clear wavy boundary.

B3—25 to 30 inches; pale brown (10YR 6/3) silty clay; common medium distinct very pale brown (10YR 7/4) and common medium prominent grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; mildly alkaline; gradual smooth boundary.

C—30 to 60 inches; light yellowish brown (10YR 6/4) stratified silt and clay; common medium prominent pinkish white (5YR 5/2) and light gray (5YR 7/1) mottles; very firm; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. It is 10 to 18 inches thick. The B horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 7; and chroma of 1 to 4. It ranges from medium acid to mildly alkaline. In some pedons the C horizon has strata of fine sand, loamy fine sand, or fine sandy loam less than 1/2 inch thick. It has hue of 7.5YR, 10YR, or 2.5Y; value of 4 to 6; and chroma of 1 to 6. Reaction is mildly alkaline or moderately alkaline.

Matherton series

The Matherton series consists of deep, somewhat poorly drained soils that dominantly are moderately permeable in the subsoil and rapidly permeable below. These soils formed in loamy and sandy material over sand and gravel outwash. They are on terraces and outwash plains. Slopes range from 0 to 3 percent.

Matherton soils are commonly adjacent to Fox, Rotamer, Sebewa, and Wacousta soils. Fox soils are similar to Matherton soils but are better drained and are higher on the landscape. Rotamer soils formed in sandy loam glacial till. They are better drained than Matherton soils and are higher on the landscape. Sebewa soils are similar to Matherton soils but are more poory drained and are lower on the landscape. Wacousta soils also are more poorly drained. They have a silty subsoil, whereas Matherton soils have a loamy and sandy subsoil.

Typical pedon of Matherton silt loam, 0 to 3 percent slopes, 1,320 feet south and 660 feet west of the northwest corner of NE1/4 sec. 8, T. 8 N., R. 15 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; very friable; neutral; abrupt smooth boundary.

B1—9 to 13 inches; dark brown (10YR 4/3) silt loam; few fine distinct grayish brown (10YR 5/2) and common medium prominent yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

B21t—13 to 18 inches; brown (10YR 5/3) sandy clay loam; common medium faint grayish brown (10YR 5/2) and common medium prominent yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; firm; thin discontinuous dark brown (10YR 4/3) clay films; slightly acid; clear wavy boundary.

B22t—18 to 24 inches; grayish brown (10YR 5/2) clay loam; common fine prominent strong brown (7.5YR 5/6) and light gray (10YR 7/2) mottles; moderate fine subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films; slightly acid; clear wavy boundary.

IIB23t—24 to 29 inches; grayish brown (10YR 5/2) sandy clay loam; common fine prominent dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films; slightly acid; clear wavy boundary.

IIB3—29 to 33 inches; brown (10YR 4/3) loamy sand; common fine prominent yellowish brown (10YR 5/8) and many medium prominent gray (10YR 6/1) mottles; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

IIC—33 to 60 inches; light gray (10YR 7/1) stratified sand and gravel; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is 6 to 10 inches thick. It has color value of 2 or 3 and chroma of 1 or 2. An A2 horizon is evident in some pedons. It is loam or silt loam and is 2 to 6 inches thick. It has color value of 5 or 6 and chroma of 2. The B horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 to 6; and chroma of 2 or 3. It is silt loam, clay loam, gravelly clay loam, sandy clay loam, loam, sandy loam, or loamy sand. Reaction ranges from medium acid to neutral. The IIC horizon is stratified sand and gravel or gravelly sand. Boulders as much as 4 feet in diameter are in the solum and substratum in some areas. The IIC horizon is mildly alkaline or moderately alkaline. It has color value of 5 to 7 and chroma of 1 to 4. In some pedons silty clay loam and silty clay layers more than 2 feet thick are below the IIC horizon. They are at a depth of 40 to 60 inches.

Mayville series

The Mayville series consists of deep, moderately well drained, moderately permeable soils on ground moraines and drumlins. These soils formed in silty and loamy material over loamy glacial till. Slopes range from 2 to 6 percent.

Mayville soils are commonly adjacent to Lamartine, Theresa, and Virgil soils. Lamartine soils are similar to Mayville soils but are more poorly drained and are lower on the landscape. Theresa soils are similar to Mayville soils but are slightly better drained and are higher on the landscape. Virgil soils are more poorly drained than Mayville soils and are lower on the landscape. Also, they have a thicker silty mantle.

Typical pedon of Mayville silt loam, 2 to 6 percent slopes, 915 feet south and 1,180 feet east of the center of sec. 22, T. 8 N., R. 16 E.

Ap—0 to 9 inches; dark gray (10YR 4/1) silt loam; moderate very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 5/3) silt loam; moderate medium platy structure parting to weak very fine subangular blocky; friable; neutral; clear smooth boundary.

B21t—12 to 18 inches; brown (10YR 4/3) silty clay loam; moderate very fine angular and subangular blocky structure; firm; few thin continuous dark brown (7.5YR 3/2) clay films; white (10YR 8/1) uncoated silt grains along vertical faces of peds; slightly acid; clear wavy boundary.

B22t—18 to 25 inches; brown (10YR 4/3) silty clay loam; strong fine angular blocky structure; firm; many thick continuous dark brown (7.5YR 3/2) clay films; strongly acid; clear wavy boundary.

IIB23t—25 to 33 inches; brown (7.5YR 4/4) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; many thick patchy dark brown (7.5YR 3/2) clay films on all faces of peds; medium acid; clear wavy boundary.

IIB3t—33 to 38 inches; yellowish brown (10YR 5/4) clay loam containing appreciable sand; common medium prominent light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; few thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; slightly acid; clear wavy boundary.

C—38 to 60 inches; light gray (10YR 7/2) and yellowish brown (10YR 5/4) gravelly sandy loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; about 20 percent gravel by volume; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates are 30 to 40 inches. The silty mantle ranges from 20 to 36 inches in thickness.

The Ap horizon has color value of 3 or 4 and chroma of 1 or 2. It is 4 to 10 inches thick. The A2 horizon is 2 to 6 inches thick unless it has been mixed with the Ap horizon by plowing. It has color value of 4 or 5 and chroma of 2 or 3. The B horizon has color value of 4 or 5 and chroma of 3 or 4. The IIB horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B and IIB horizon range from slightly acid to strongly acid. The C horizon is sandy loam or gravelly sandy loam that has color value of 4 to 7 and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. The gravel content ranges, by volume, from 5 to 30 percent. The calcium carbonate equivalent ranges from 15 to 35 percent.

McHenry series

The McHenry series consists of deep, well drained, moderately permeable soils on till plains and drumlins. These soils formed in silty and loamy deposits over gravelly sandy loam glacial till. Slopes range from 2 to 12 percent.

McHenry soils are similar to Kidder and Mayville soils and are adjacent to Lamartine, Matherton, and Rotamer soils. Kidder soils lack the silty mantle characteristic of McHenry soils. The somewhat poorly drained Lamartine soils are below areas of McHenry soils. Matherton soils are more poorly drained than McHenry soils and are underlain by sand and gravel outwash. Mayville soils are slightly less well drained than McHenry soils. Rotamer soils are above areas of McHenry soils, have a thinner solum, and lack the silty upper story characteristic of those soils.

Typical pedon of McHenry silt loam, 6 to 12 percent slopes, eroded, in an uneroded area 1,250 feet west and 60 feet south of the center of sec. 33, T. 8 N., R. 14 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

B1—8 to 12 inches; brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; neutral; abrupt wavy boundary.

B21t—12 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; medium very fine subangular and angular blocky structure; firm;

common thin continuous dark yellowish brown (10YR 3/4) clay films; medium acid; clear wavy boundary.

IIB22t—22 to 29 inches; brown (7.5YR 4/4) sandy clay loam; medium fine subangular blocky structure; firm; many thick continuous dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; medium acid; clear wavy boundary.

IIB3t—29 to 36 inches; brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; friable; few thin patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; slightly acid; gradual irregular boundary.

IIC1—36 to 42 inches; yellowish brown (10YR 5/4) gravelly sandy loam; massive; very friable; about 15 percent gravel by volume; slight effervescence; mildly alkaline; clear wavy boundary.

IIC2—42 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy loam; massive; very friable; 15 percent gravel by volume; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 50 inches. The silty mantle is 15 to 30 inches thick.

The Ap horizon has color value of 4 or 5 and chroma of 2 or 3. It is 7 to 10 inches thick. The B and IIB horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. The IIB horizon is clay loam or sandy clay loam. The solum typically is medium acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon is sandy loam or gravelly sandy loam. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline. The content of gravel ranges, by volume, from 5 to 30 percent. The calcium carbonate equivalent ranges from 15 to 35 percent.

Milford series

The Milford series consists of deep, poorly drained and very poorly drained, moderately slowly permeable soils on terraces in old lake basins. These soils formed in silty and clayey lake-laid sediments. Slopes range from 0 to 2 percent.

These Milford soils differ from the typical Milford soils; they have a thinner mollic epipedon, a thinner solum, and a less acid subsoil and are shallower to free carbonates. These differences, however, do not affect the use or behavior of the soils.

Milford soils are similar to Wacousta soils and are adjacent to Matherton, Sebewa, and Palms soils. Matherton soils are above Milford soils on the landscape and have a loamy and sandy subsoil and a gravelly sand substratum. Sebewa soils have a loamy subsoil. Palms soils are slightly below areas of Milford soils and have an organic upper story. Wacousta soils contain less clay in the B horizon than Milford soils.

Typical pedon of Milford silty clay loam, 1,500 feet east and 1,050 feet south of the center of sec. 5, T. 5 N., R. 15 E.

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure; friable; mildly alkaline; abrupt smooth boundary.

B21g—11 to 13 inches; dark gray (10YR 4/1) silty clay loam; weak fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) krotovinas; mildly alkaline; clear wavy boundary.

B22g—13 to 19 inches; light brownish gray (2.5Y 6/2) silty clay; common fine prominent yellowish brown (10YR 5/8) mottles; weak fine angular blocky structure; firm; many very dark grayish brown (10YR 3/2) krotovinas; thin patchy organic stains on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

B23g—19 to 28 inches; light brownish gray (10YR 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak fine angular blocky; firm; thin patchy very dark grayish brown (10YR 3/2) organic stains on faces of peds; strong effervescence; mildly alkaline; clear wavy boundary.

Cg—28 to 60 inches; light brownish gray (2.5Y 6/2) and gray (5Y 6/1) stratified silt and clay; many medium prominent brownish yellow (10YR 6/8) and common fine distinct pinkish gray (7.5YR 6/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches.

The Ap horizon is 10 to 16 inches thick. It has color value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The average clay content in the B horizon ranges from 35 to 55 percent. The solum is neutral or mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6; and chroma of 1 or 2. It has a bulk texture of dominantly silty clay loam but consists of strata of loamy and clayey material. It is mildly alkaline or moderately alkaline.

Moundville series

The Moundville series consists of deep, moderately well drained, rapidly permeable soils on outwash plains. These soils formed in sandy outwash. Slopes range from 1 to 6 percent.

Moundville soils are commonly adjacent to Boyer, Chelsea, Wasepi, and Yahara soils. Boyer and Wasepi soils contain more clay in the subsoil than Moundville soils. Chelsea soils have sandy loam or loamy fine sand lamellae below a depth of about 40 inches. Wasepi and Yahara soils are more poorly drained than Moundville soils and are lower on the landscape. Also, Yahara soils have a thicker, darker surface layer.

Typical pedon of Moundville loamy sand, 1 to 6 percent slopes, 915 feet west and 620 feet south of the northeast corner of SE1/4 sec. 27, T. 5 N., R. 16 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) loamy sand; weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

A12—8 to 10 inches; dark brown (7.5YR 3/2) loamy sand; weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

B1t—10 to 20 inches; dark brown (7.5YR 4/4) loamy sand; weak moderate prismatic structure parting to weak fine subangular blocky; very friable; extensive clay bridging between sand grains; medium acid; clear smooth boundary.

B2t—20 to 26 inches; dark brown (7.5YR 4/4) loamy sand; weak medium prismatic structure parting to weak medium subangular blocky; very friable; clay bridging between sand grains; slightly acid; gradual wavy boundary.

B3—26 to 36 inches; yellowish brown (10YR 5/6) sand; few fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very friable; slightly acid; clear wavy boundary.

C—36 to 60 inches; light yellowish brown (10YR 6/4) sand; few medium distinct brown (7.5YR 4/4) and grayish brown (10YR 5/2) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 24 to 40 inches.

The A horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. It is 6 to 16 inches thick. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The solum ranges from slightly acid to strongly acid. The C horizon has color value and chroma of 4 to 6. It is slightly acid or neutral.

Otter series

The Otter series consists of deep, poorly drained, moderately permeable soils on stream bottoms. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Otter soils are commonly adjacent to Lamartine, Palms, Radford, and Virgil soils. Lamartine soils are underlain by sandy loam till and are slightly above areas of Otter soils. Palms soils are below areas of Otter soils. They have an organic upper story. Radford soils are similar to Otter soils but are slightly better drained and are higher on the landscape. Virgil soils also are higher on the landscape and are somewhat poorly drained. They are underlain by sandy loam drift.

Typical pedon of Otter silt loam, 100 feet north and 75 feet east of the southwest corner of sec. 18, T. 5 N., R. 13 E.

Ap—0 to 8 inches; black (N 2/0) silt loam; weak very fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A11—8 to 17 inches; black (10YR 2/1) silt loam; weak fine granular structure; very friable; slightly acid; clear wavy boundary.

A12—17 to 26 inches; black (10YR 2/1) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak very fine subangular blocky structure parting to weak very fine granular; friable; slightly acid; clear wavy boundary.

A13—26 to 30 inches; very dark gray (10YR 3/1) silt loam; few fine prominent yellowish brown (10YR 5/8) and common medium prominent grayish brown (10YR 5/2) mottles; weak thin platy structure parting to weak very fine granular; friable; medium acid; clear wavy boundary.

B21g—30 to 35 inches; dark gray (5Y 4/1) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure parting to weak very fine granular; firm; white (5Y 8/1) clean silt grains on all faces of peds; very dark brown (10YR 2/2) organic stains along root channels; slightly acid; clear wavy boundary.

B22g—35 to 41 inches; gray (5Y 5/1) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak very fine subangular blocky structure; firm; slightly acid; clear wavy boundary.

C—41 to 60 inches; olive gray (5Y 5/2) silt loam; moderate medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) mottles; massive; firm; neutral.

The thickness of the solum ranges from 40 to 60 inches.

The A horizon has color value of 2 or 3 and chroma of 0 or 1. It ranges from medium acid to mildly alkaline. The B horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 8; and chroma of 1 or 2. It ranges from slightly acid to mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1 or 2. It ranges from neutral to moderately alkaline.

Palms series

The Palms series consists of deep, very poorly drained, moderately permeable soils that formed in 16 to 51 inches of organic material accumulated mainly from sedges and that are underlain by loamy deposits. These soils are in depressions in old lake basins. Slopes range from 0 to 2 percent.

Palms soils are adjacent to Barry, Houghton, Keowns, and Wacousta soils. Barry, Keowns, and Wacousta soils are above areas of Palms soils. They formed in mineral deposits. Houghton soils are similar to Palms soils but are deeper over the underlying mineral material.

Typical pedon of Palms muck, 365 feet west and 465 feet north of the center of sec. 33, T. 8 N., R. 15 E.

Oap—0 to 9 inches; black (N 2/0) unrubbed, black (10YR 2/1) rubbed, sapric material; less than 5 percent fiber rubbed and unrubbed; weak thin platy structure parting to weak fine granular; very friable; fibers primarily herbaceous; about 15 to 20 percent mineral soil material; common roots; neutral; abrupt smooth boundary.

Oa2—9 to 23 inches; black (10YR 2/1) unrubbed, very dark brown (10YR 2/2) rubbed, sapric material; about 35 percent fiber unrubbed, less than 5 percent rubbed; weak thick platy structure; very friable; fibers primarily herbaceous; about 10 percent mineral soil material; few roots; neutral; clear wavy boundary.

Oa3—23 to 31 inches; black (N 2/0) unrubbed, very dark brown (10YR 2/2) rubbed, sapric material; about 10 percent fiber unrubbed, less than 5 percent rubbed; weak medium prismatic structure parting to weak fine subangular blocky; very friable; fibers primarily herbaceous; about 20 percent mineral soil material; few roots; neutral; abrupt wavy boundary.

IIC1g—31 to 35 inches; dark gray (10YR 4/1) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few thin black (10YR 2/1) coatings on vertical faces of peds; neutral; abrupt wavy boundary.

IIC2—35 to 60 inches; dark grayish brown (10YR 4/2) silt loam; massive; firm; neutral.

The organic layer ranges from 16 to 51 inches in thickness. It is primarily sapric material. Some pedons have thin layers of hemic material that, combined, are less than 10 inches thick. Layers of fibric material that, combined, are less than 5 inches thick are in the lower part of the organic layer. Some pedons contain woody fragments. The organic layer has hue of N or 10YR, value of 2 or 3, and chroma of 0 to 2. It ranges from strongly acid to moderately alkaline. In many pedons the mineral content of the organic material just above the IIC horizon is high; it can be as much as 50 percent of the volume.

The IIC horizon is sandy loam, silt loam, silty clay loam, or clay loam. It has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1 or 2. It ranges from slightly acid to moderately alkaline.

Radford series

The Radford series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains and foot slopes. These soils formed in recent silty alluvium overlying a buried silty soil. Slopes range from 0 to 3 percent.

These Radford soils differ from the typical Radford soils because they lack a C horizon above the buried soil, but this difference does not alter their use or behavior.

Radford soils are adjacent to Barry, Boyer, Juneau, Lamartine, and Otter soils on the landscape. Barry soils are slightly lower on the landscape than Radford soils. They are underlain by sandy loam till. The well drained Boyer soils are underlain by stratified sand and gravel. Juneau soils are similar to Radford soils but are better drained and have light colored rather than dark colored alluvium. Lamartine soils are underlain by sandy loam till and lack the silty overburden characteristic of Radford soils. Otter soils are slightly more poorly drained than Radford soils and are lower on the landscape.

Typical pedon of Radford silt loam, 0 to 3 percent slopes, 2,600 feet east and 1,200 feet north of the center of sec. 21, T. 6 N., R. 13 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

A12—9 to 22 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; many very dark brown (10YR 2/2) worm and root channels; neutral; clear smooth boundary.

IIA1b—22 to 30 inches; black (10YR 2/1) silty clay loam; weak medium granular structure; friable; neutral; gradual smooth boundary.

IIB21gb—30 to 34 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

IIB22gb—34 to 38 inches; grayish brown (10YR 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

IIB23gb—38 to 48 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8) and many fine prominent yellow (10YR 7/8) mottles; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

IICg—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent brownish yellow (10YR 6/8) mottles; massive; firm; slightly acid.

The solum ranges from 40 to 80 inches in thickness. The recent silty alluvium is 20 to 40 inches thick.

The A1 and Ap horizons have color value of 2 or 3 and chroma of 1 or 2. Reaction is slightly acid to mildly alkaline. The IIAb horizon has hue of N or 10YR, value of 2 or 3, and chroma of 1 or 2. It is 8 to 15 inches thick. The IIB horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. Reaction is neutral or mildly alkaline. The IIC horizon is silt loam, silty clay loam or loam. It has hue of 10YR or 2.5Y and value of 4 to 6. Reaction ranges from slightly acid to mildly alkaline.

Ringwood series

The Ringwood series consists of deep, well drained, moderately permeable soils on till plains. These soils formed in silty and loamy material underlain by gravelly sandy loam glacial till. Slopes range from 2 to 6 percent.

Ringwood soils are near Griswold, Kidder, McHenry, and St. Charles soils. Griswold soils are similar to Ringwood soils, but they lack the silty upper part. Kidder, McHenry, and St. Charles soils have a lighter colored surface layer than Ringwood soils. Also, St. Charles soils have a thicker silty mantle.

Typical pedon of Ringwood silt loam, 2 to 6 percent slopes, 1,600 feet south and 300 feet east of the center of sec. 17, T. 7 N., R. 14 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam; weak very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A3—10 to 14 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

B21t—14 to 20 inches; brown (10YR 4/3) silty clay loam; moderate fine angular and subangular blocky structure; firm; thick discontinuous very dark grayish brown (10YR 3/2) clay films and organic stains; medium acid; clear wavy boundary.

IIB22t—20 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; firm; thick discontinuous very dark grayish brown (10YR 3/2) clay films; about 5 percent gravel by volume; medium acid; clear wavy boundary.

IIB3t—24 to 39 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films; few patchy very dark grayish brown (10YR 3/2) organic stains; about 5 percent gravel by volume; slightly acid; clear wavy boundary.

IIC—39 to 60 inches; yellowish brown (10YR 5/4) gravelly sandy loam; massive; friable; about 20 percent gravel by volume; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. The silty upper part of the solum ranges from 15 to 30 inches in thickness.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. It is 10 to 16 inches thick. The B horizon is silt loam or silty clay loam. It has color value and chroma of 3 or 4. The IIB horizon is clay loam, sandy clay loam, or loam. It has hue of 10YR or 7.5YR and value of 4 or 5. Reaction ranges from medium acid to neutral in the B horizon and from medium acid to moderately alkaline in the IIB horizon. The C horizon is sandy loam or gravelly sandy loam. It has value of 5 or 6 and chroma of 3 or 4. Reaction is mildly alkaline or moderately alkaline. The calcium carbonate equivalent ranges from 20 to 35 percent.

Rodman series

The Rodman series consists of deep, excessively drained, very rapidly permeable soils on kames and eskers on outwash plains. These soils formed in loamy deposits over sand and gravel. Slopes range from 12 to 45 percent.

Rodman soils are commonly adjacent to Boyer, Casco, and Lorenzo soils. These adjacent soils have a thicker, finer textured subsoil than Rodman soils.

Typical pedon of Rodman gravelly sandy loam, in an area of Casco-Rodman complex, 20 to 45 percent slopes, 1,170 feet west and 200 feet north of the center of sec. 26, T. 5 N., R. 16 E.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam; weak very fine granular structure; very friable; mildly alkaline; clear smooth boundary.

B2—6 to 13 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; weak very fine subangular blocky structure; very friable; about 20 percent gravel by volume; mildly alkaline; abrupt smooth boundary.

IIC1—13 to 16 inches; light yellowish brown (10YR 6/4) stratified sand and gravel; single grain; loose; strong effervescence; mildly alkaline; abrupt smooth boundary.

IIC2—16 to 60 inches; brown (10YR 5/3) stratified sand and gravel; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates are 8 to 15 inches.

The A horizon is dominantly gravelly sandy loam, but the range includes gravelly loam. This horizon has color value of 2 or 3 and chroma of 1 or 2. It is 4 to 8 inches thick. The B horizon has color value of 3 to 5 and chroma of 3 or 4. It is loam, gravelly loam, or gravelly sandy loam and is neutral or mildly alkaline. The C horizon has color value of 4 to 6 and chroma of 1 to 4. It is mildly alkaline or moderately alkaline.

Rotamer series

The Rotamer series consists of deep, well drained, moderately permeable soils on drumlins and side slopes on till plains. These soils formed in loamy material over loamy glacial till. Slopes range from 2 to 30 percent.

Rotamer soils are adjacent to Kidder and McHenry soils. These adjacent soils are deeper over gravelly sandy loam glacial till than Rotamer soils. Also, McHenry soils are silty in the upper part of the solum.

Typical pedon of Rotamer loam, 12 to 20 percent slopes, eroded, 2,540 feet east and 20 feet north of the center of sec. 2, T. 7 N., R. 14 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) loam; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

B2t—7 to 11 inches; dark brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; patchy dark brown (7.5YR 3/2) clay films on all faces of peds; about 5 percent gravel by volume; neutral; abrupt smooth boundary.

B3t—11 to 13 inches; yellowish brown (10YR 5/4) sandy clay loam; weak fine subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel by volume; neutral; abrupt smooth boundary.

C—13 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy loam; massive; very friable; about 25 percent gravel by volume; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates are 12 to 24 inches.

The A horizon has color value and chroma of 2 or 3. The Bt horizon is sandy clay loam or clay loam. It has hue of 10YR or 7.5YR and chroma and value of 3 to 5. It ranges from slightly acid to mildly alkaline. The C horizon is sandy loam or gravelly sandy loam. It has color value of 5 or 6 and chroma of 3 to 6. It is mildly alkaline or moderately alkaline. The gravel content ranges from 15 to 60 percent and the calcium carbonate equivalent from 20 to 40 percent.

St. Charles series

The St. Charles series consists of deep, moderately well drained soils that are moderately permeable throughout or are moderately permeable in the upper part and very rapidly permeable in the substratum. These soils are on till plains, stream terraces, and outwash plains. They formed in thick deposits of windblown silty material and in the underlying loamy glacial drift. Slopes range from 0 to 6 percent.

St. Charles soils are similar to Dodge and Virgil soils and are adjacent to Kidder, Rotamer, Theresa, and Virgil soils. Dodge soils have a thinner silty mantle than St. Charles soils. Kidder, Rotamer, and Theresa soils also have a thinner silty mantle and have a thinner solum. Virgil soils are lower on the landscape than St. Charles soils and are more poorly drained.

Typical pedon of St. Charles silt loam, moderately well drained, 2 to 6 percent slopes, 1,400 feet south and 1,000 feet west of the center of sec. 28, T. 8 N., R. 14 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; very friable; neutral; abrupt smooth boundary.

B1—8 to 15 inches; dark brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—15 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films; slightly acid; clear smooth boundary.

B22t—21 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; thick continuous dark brown (10YR 3/3) clay films; slightly acid; gradual wavy boundary.

B23t—31 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct brownish yellow (10YR 6/6) mottles; moderate medium angular blocky structure; firm; thick continuous dark brown (10YR 3/3) clay films; slightly acid; gradual wavy boundary.

B31t—40 to 45 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin patchy dark brown (10YR 3/3) clay films on all faces of peds; slightly acid; clear wavy boundary.

IIB32t—45 to 50 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin patchy dark brown (10YR 3/3) clay films on all faces of peds; medium acid; clear wavy boundary.

IIC—50 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; about 5 percent gravel by volume; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 44 to 70 inches. The loess ranges from 40 to 60 inches in thickness.

The A1 or Ap horizon has color value of 3 or 4. The upper part of the B horizon has color value of 4 or 5 and chroma of 3 or 4. The IIB horizon is sandy loam, clay loam, sandy clay loam, or loam. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The subsoil ranges from strongly acid to slightly acid in the upper part and from medium acid to neutral in the lower part. The C horizon is sandy loam, gravelly sandy loam, or sand and gravel. Reaction ranges from neutral to moderately alkaline. The calcium carbonate equivalent in the glacial till is 20 to 35 percent.

Salter series

The Salter series consists of deep, well drained and moderately well drained, moderately permeable soils on terraces in old lake basins. These soils formed in sandy and loamy material and are underlain by stratified silt, fine sand, and very fine sand. Slopes range from 2 to 6 percent.

Salter soils are adjacent to Chelsea, Sisson, and Yahara soils and the Watseka Variant. Chelsea soils have a coarser textured substratum than Salter soils. Sisson soils have a finer textured subsoil. The Watseka Variant and the Yahara soils are lower than Salter soils on the landscape and are more poorly drained. Also, Yahara soils have a thicker, darker colored surface layer and the Watseka Variant has a coarser textured subsoil and substratum.

Typical pedon of Salter loamy sand, 2 to 6 percent slopes, 1,200 feet north and 530 feet east of the southwest corner of sec. 15., T. 5 N., R. 16 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand; weak fine subangular blocky structure; very friable; abrupt smooth boundary.

B1—9 to 14 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

B2—14 to 21 inches; dark brown (7.5YR 4/4) sandy loam; moderate fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

C2—21 to 60 inches; pale brown (10YR 6/3) stratified coarse silt, fine sand, and very fine sand; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 40 inches. The depth to free carbonates ranges from 18 to 40 inches.

The Ap horizon has color value of 2 to 4 and chroma of 1 or 2. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is dominantly silt loam, loam, sandy loam, fine sandy loam, very fine sandy loam, or loamy sand. Some subhorizons are loamy fine sand, loamy very fine sand, fine sand, or very fine sand. The 10- to 40-inch control section averages between 8 and 18 percent clay and between 15 and 70 percent fine sand and coarser sand. Some pedons have high chroma mottles below a depth of about 20 inches. The B horizon ranges from neutral to moderately alkaline. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is stratified silt, silt loam,

loam, fine sandy loam, fine sand, or very fine sand. It is mildly alkaline or moderately alkaline.

Saylesville series

The Saylesville series consists of deep, moderately well drained, moderately slowly permeable soils on terraces in old lake basins. These soils formed in silty and clayey lake-laid sediments. Slopes range from 2 to 12 percent.

Saylesville soils are adjacent to Kidder, Martinton, and Milford soils. Kidder soils are on till plains above areas of Saylesville soils. Martinton soils are somewhat poorly drained and are slightly lower on the landscape than Saylesville soils. They have a thicker, darker colored surface layer than Saylesville soils. Milford soils are below areas of Saylesville soils and are more poorly drained.

Typical pedon of Saylesville silt loam, 2 to 6 percent slopes, 1,980 feet east and 350 feet south of the northwest corner of sec. 19, T. 7 N., R. 15 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

B21t—10 to 15 inches; brown (7.5YR 4/4) silty clay; moderate medium angular blocky structure; firm; thick continuous dark brown (7.5YR 3/2) clay films; neutral; clear wavy boundary.

B22t—15 to 21 inches; brown (7.5YR 4/4) clay; strong medium angular blocky structure; very firm; thick continuous dark brown (7.5YR 3/2) clay films; neutral; clear wavy boundary.

B3t—21 to 32 inches; brown (10YR 5/3) silty clay loam; moderate fine angular blocky structure; firm; thin patchy dark brown (7.5YR 4/4) clay films on all faces of peds; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—32 to 41 inches; yellowish brown (10YR 5/4) silty clay loam; few fine prominent brownish yellow (10YR 6/8) mottles; weak medium platy structure; very firm; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—41 to 60 inches; light yellowish brown (10YR 6/4) stratified silt and clay; few fine prominent brownish yellow (10YR 6/8) mottles; massive; very firm; white (10YR 8/1) uncoated silt or lime grains between strata; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches.

The A horizon is silt loam or silty clay loam and is 6 to 10 inches thick. It has color value of 4 or 5. The B horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. Reaction ranges from medium acid to mildly alkaline. The C horizon consists of thin strata of silt, clay, silty clay, or silty clay loam and a few strata of fine sand or fine sandy loam. It has color value of 3 to 6 and chroma of 3 or 4 and is mildly alkaline or moderately alkaline.

Sebewa series

The Sebewa series consists of deep, poorly drained and very poorly drained soils that are dominantly moderately permeable in the upper part and rapidly permeable in the substratum. These soils are in depressions in outwash plains. They formed in loamy deposits over coarse sand. Slopes range from 0 to 2 percent.

Sebewa soils are commonly adjacent to Adrian and Matherton soils and the Watseka Variant. Adrian soils have an organic layer that is 16 to 51 inches thick. Matherton soils are better drained than Sebewa soils and are higher on the landscape. The Watseka Variant has a thinner, coarser textured solum than Sebewa soils.

Typical pedon of Sebewa silt loam, 850 feet south and 100 feet east of the northwest corner of SW1/4 sec. 18, T. 8 N., R. 15 E.

Ap—0 to 11 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B21tg—11 to 15 inches; grayish brown (10YR 5/2) clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; thin patchy clay films on all faces of peds; mildly alkaline; clear wavy boundary.

B22tg—15 to 21 inches; gray (10YR 5/1) loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films on all faces of peds; mildly alkaline; gradual wavy boundary.

B3g—21 to 27 inches; gray (5Y 6/1) loam; weak medium subangular blocky structure; friable; mildly alkaline; clear wavy boundary.

IIC—27 to 60 inches; light brownish gray (2.5Y 6/2) coarse sand; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is dominantly silt loam, but the range includes loam. This horizon is 8 to 12 inches thick. It has color value of 2 or 3 and chroma of 1 or 2. The B2 horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 or 2. It is gravelly clay loam, clay loam, or loam. The solum ranges from slightly acid to mildly alkaline. The IIC horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is mildly alkaline or moderately alkaline and is coarse sand, sand, or stratified sand and gravel. In some areas silty and clayey deposits are below a depth of 40 inches.

Sisson series

The Sisson series consists of deep, well drained, moderately permeable soils on terraces in old lake basins. These soils formed in loamy material over coarse silt and very fine sand. Slopes range from 1 to 12 percent.

Sisson soils are commonly adjacent to Keowns, Kibbie, Tuscola, and Yahara soils. Keowns, Kibbie, and Tuscola soils are similar to Sisson soils but are lower on the landscape and are more poorly drained. Yahara soils also are more poorly drained. They have a coarser textured subsoil and a darker colored surface layer.

Typical pedon of Sisson fine sandy loam, 6 to 12 percent slopes, eroded, 60 feet east and 1,850 feet south of the northwest corner of sec. 10, T. 6 N., R. 15 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

B1—8 to 15 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—15 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure parting to moderate very fine angular blocky; firm; thick patchy dark brown (10YR 3/3) clay films on all faces of peds; mildly alkaline; clear wavy boundary.

B22t—20 to 26 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; medium discontinuous dark brown (10YR 3/3) clay films; mildly alkaline; gradual wavy boundary.

C—26 to 60 inches; yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) stratified coarse silt and very fine sand; very friable; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is dominantly fine sandy loam, but the range includes silt loam. This horizon is 6 to 10 inches thick. It has color value of 3 to 5

and chroma of 2 or 3. The B horizon is silty clay loam, silt loam, loam, sandy loam, or fine sandy loam. It has color value of 4 or 5. It ranges from slightly acid to mildly alkaline. The C horizon has thin lenses of sand or clay in some pedons. It has color value of 4 to 6 and chroma of 3 or 4. Reaction is mildly alkaline or moderately alkaline.

Theresa series

The Theresa series consists of deep, well drained, moderately permeable soils on drumlins and till plains. These soils formed in thin windblown silty deposits and in the underlying loamy glacial till. Slopes range from 2 to 12 percent.

These Theresa soils differ from the typical Theresa soils because they have a lower calcium carbonate equivalent within a depth of 40 inches, but this difference does not alter the use or behavior of the soils.

Theresa soils are commonly adjacent to Kidder, Lamartine, and Rotamer soils on the landscape. Rotamer soils are less silty in the upper part of the profile than Theresa soils and have a thinner solum. Kidder soils lack a silty mantle. Lamartine soils are more poorly drained than Theresa soils and are lower on the landscape.

Typical pedon of Theresa silt loam, 2 to 6 percent slopes, 2,600 feet south and 400 feet east of the northwest corner of sec. 21, T. 8 N., R. 16 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

B1—9 to 13 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21t—13 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous very dark grayish brown (10YR 3/2) clay films; neutral; clear wavy boundary.

IIB22t—18 to 26 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thick continuous dark brown (7.5YR 3/2) clay films; about 5 percent gravel by volume; neutral; clear wavy boundary.

IIB3t—26 to 30 inches; yellowish brown (10YR 5/4) loam; moderate coarse subangular blocky structure; firm; thin patchy very dark grayish brown (10YR 3/2) clay films; about 5 percent gravel by volume; neutral; clear wavy boundary.

IIC—30 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy loam; massive; very friable; about 20 percent gravel by volume; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 40 inches. The upper part of the solum, which formed in loess, is 10 to 22 inches thick.

The Ap horizon is 6 to 10 inches thick. It has color value of 2 to 4 and chroma of 2 or 3. The B2 and IIB2 horizons have hue of 7.5YR or 10YR and value and chroma of 3 or 4. The IIB2 horizon is clay loam, sandy clay loam, or loam. The subsoil typically is slightly acid to neutral in the upper part and neutral to moderately alkaline in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 3 or 4. It is gravelly sandy loam or sandy loam. It is mildly alkaline or moderately alkaline. It has a calcium carbonate equivalent of 20 to 40 percent.

Tuscola series

The Tuscola series consists of deep, moderately well drained, moderately permeable soils on terraces in old lake basins. These soils formed in loamy deposits over lake-laid coarse silt, fine sand, and very fine sand. Slopes range from 0 to 6 percent.

Tuscola soils are near Casco, Keowns, Kibbie, and Sisson soils. Casco soils are better drained than Tuscola soils and are higher on the landscape. They are underlain by gravelly sand. Keowns soils are more poorly drained than Tuscola soils and are lower on the landscape. Also, they contain less clay in the subsoil. Kibbie soils formed in material similar to that in which Tuscola soils formed but are more poorly drained and are lower on the landscape. Sisson soils also formed in similar material but are slightly better drained.

Typical pedon of Tuscola silt loam, 0 to 2 percent slopes, 1,320 feet south and 660 feet west of the northeast corner of sec. 2, T. 7 N., R. 14 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A2—7 to 10 inches; brown (10YR 5/3) silt loam; weak very thin platy structure; very friable; grayish brown (10YR 5/2) clean silt grains on all faces of peds; neutral; clear wavy boundary.

B1—10 to 14 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; brown (10YR 5/3) silt grains on all faces of peds; medium acid; clear wavy boundary.

B21t—14 to 19 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films; medium acid; clear wavy boundary.

B22t—19 to 23 inches; brown (10YR 4/3) loam; moderate medium angular blocky structure; firm; thick continuous dark brown (7.5YR 4/4) clay films; medium acid; clear wavy boundary.

B23t—23 to 29 inches; yellowish brown (10YR 5/6) clay loam; few fine faint brownish yellow (10YR 6/6) and common fine prominent grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; firm; thick continuous brown (10YR 4/3) clay films; slightly acid; gradual wavy boundary.

B3t—29 to 32 inches; yellowish brown (10YR 5/4) fine sandy loam; common medium prominent yellowish brown (10YR 5/8) and common medium distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films; slightly acid; abrupt smooth boundary.

IIC—32 to 60 inches; pinkish gray (7.5YR 6/2) and pale brown (10YR 6/3) stratified coarse silt, fine sand, and very fine sand; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 44 inches.

The Ap horizon has color value of 3 or 4 and chroma of 1 or 2. The A2 horizon is 2 to 6 inches thick unless it has been mixed with the Ap horizon by plowing. It has color value of 5 or 6 and chroma of 3 or 4. The B horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 to 6; and chroma of 2 to 6. It is silty clay loam, clay loam, loam, or fine sandy loam. It ranges from medium acid in the upper part to neutral in the lower part. The C horizon is stratified coarse silt and fine sand and thin layers of silt, fine sand, very fine sand, and loamy fine sand. It has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 3. Reaction is mildly alkaline or moderately alkaline.

Virgil series

The Virgil series consists of deep, somewhat poorly drained, moderately permeable or moderately slowly permeable soils on stream terraces, till plains, and outwash plains. These soils formed in a thick deposit of windblown silty material and in the underlying loamy glacial drift. Slopes range from 0 to 6 percent.

Virgil soils are near Casco, Dodge, Fox, Keowns, Lamartine, Matherton, St. Charles, Theresa, and Wacousta soils. Casco, Dodge, Fox, and Theresa soils are above areas of Virgil soils and have a thinner solum. Keowns and Wacousta soils are below areas of Virgil soils. Keowns soils have a silt and very fine sand substratum, and Wacousta soils have a thinner subsoil that formed entirely in silty material. Lamartine and Matherton soils are shallower over underlying glacial drift than Virgil soils. St. Charles soils are similar to Virgil soils but are slightly better drained and are higher on the landscape.

Typical pedon of Virgil silt loam, 2 to 6 percent slopes, 1,000 feet west and 100 feet south of the northeast corner of sec. 12, T. 8 N., R. 15 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A2—8 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak thick platy structure; friable; neutral; clear smooth boundary.

B21t—10 to 15 inches; dark brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular and angular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films; few brown (10YR 5/3) silt grains on faces of peds; slightly acid; clear wavy boundary.

B22t—15 to 26 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium prominent olive yellow (2.5Y 6/8) and common medium distinct light brownish gray (2.5Y 6/2) mottles; weak moderate very fine subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films; slightly acid; clear wavy boundary.

B31g—26 to 41 inches; grayish brown (2.5Y 5/2) silt loam; many medium prominent olive yellow (2.5Y 6/6) mottles; weak thick platy structure parting to weak fine subangular blocky; firm; grayish brown (10YR 5/2) clay flows and organic stains in pores and on faces of peds; neutral; clear wavy boundary.

IIB32g—41 to 48 inches; grayish brown (2.5Y 5/2) loam; many medium prominent olive yellow (2.5Y 6/6) mottles; weak medium subangular blocky structure; firm; neutral; clear wavy boundary.

IIC—48 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; few fine distinct olive yellow (2.5Y 6/6) and common medium distinct light brownish gray (2.5Y 6/2) mottles; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 45 to 70 inches. The loess mantle is more than 40 inches thick.

The Ap horizon is 6 to 10 inches thick. It has color value of 2 or 3 and chroma of 1 or 2. The A2 horizon has color value of 4 or 5 and chroma of 1 or 2. The silty upper part of the B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The lower part has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam, loam, sandy clay loam, or clay loam. The B horizon is strongly acid to slightly acid in the upper part and medium acid to neutral in the lower part. The C horizon is sandy loam, gravelly sandy loam, or gravelly sand. It is neutral to moderately alkaline.

Wacousta series

The Wacousta series consists of deep, poorly drained and very poorly drained, moderately slowly permeable soils in depressions in old lake basins and in low areas between drumlins. These soils formed in silty lake-laid material. Slopes range from 0 to 2 percent.

Wacousta soils are adjacent to Houghton, Lamartine, and Matherton soils on the landscape. Houghton soils are below areas of Wacousta soils and formed in organic material. Lamartine and Matherton soils are higher on the landscape than Wacousta soils and are slightly better drained. They contain more sand in the substratum.

Typical pedon of Wacousta silty clay loam, 680 feet south and 400 feet west of the center of sec. 22, T. 8 N., R. 16 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 13 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct grayish brown (10YR 5/2) and few fine prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

B2g—13 to 19 inches; olive gray (5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; firm; slight effervescence; mildly alkaline; clear wavy boundary.

C1g—19 to 38 inches; gray (5Y 5/1) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; mildly alkaline; clear wavy boundary.

C2g—38 to 60 inches; light gray (5Y 6/1) silt loam stratified with a few thin layers of fine sandy loam; few fine prominent yellowish brown (10YR 5/4) mottles; friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 10 to 24 inches. The depth to free carbonates is 12 to 20 inches.

The A horizon is 10 to 15 inches thick. It has hue of N or 10YR, value of 2 or 3, and chroma of 0 or 1. The Bg horizon has color value of 4 to 6 and chroma of 1 or 2. It is neutral or mildly alkaline. The Cg horizon has color value of 5 or 6 and chroma of 1 or 2. It is silt loam stratified with fine sandy loam or silty clay loam. It is mildly alkaline or moderately alkaline.

Wasepi series

The Wasepi series consists of deep, somewhat poorly drained soils that are moderately rapidly permeable in the upper part and very rapidly permeable in the substratum. These soils are on stream terraces. They formed in loamy and sandy deposits over gravelly sand. Slopes range from 0 to 3 percent.

Wasepi soils are adjacent to Boyer, Fox, Gilford, Sebewa, and Wacousta soils. Boyer soils are similar to Wasepi soils but are better drained and are higher on the landscape. Fox soils also are better drained and have a finer textured subsoil. Gilford soils are similar to Wasepi soils but are more poorly drained and are lower on the landscape. Sebewa and Wacousta soils also are lower on the landscape and more poorly drained, and they have a finer textured subsoil.

Typical pedon of Wasepi sandy loam, 0 to 3 percent slopes, 650 feet south and 1,400 feet east of the northwest corner of SW1/4 sec. 26, T. 7 N., R. 16 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) sandy loam; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

B21t—9 to 16 inches; brown (10YR 5/3) sandy clay loam; common medium prominent yellowish red (5YR 4/6) and common medium faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; thin patchy dark brown (10YR 3/3) clay films on all faces of peds; slightly acid; clear wavy boundary.

B22t—16 to 20 inches; brown (10YR 5/3) sandy loam; common fine faint light brownish gray (10YR 6/2) and common medium prominent yellowish red (5YR 4/6) mottles; weak fine subangular blocky struc-

ture; friable; thin patchy dark brown (10YR 3/3) clay films on all faces of peds; slightly acid; clear wavy boundary.

B23t—20 to 26 inches; dark brown (10YR 4/3) sandy loam; common fine distinct light brownish gray (10YR 6/2) and common fine prominent yellowish red (5YR 4/6) mottles; weak fine subangular blocky structure; friable; clay bridging between sand grains; medium acid; clear wavy boundary.

IIB3t—26 to 38 inches; dark brown (10YR 4/3) loamy sand; common medium prominent yellowish red (5YR 4/6) and few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; clay bridging between sand grains; medium acid; clear wavy boundary.

IIC—38 to 60 inches; grayish brown (10YR 5/2) stratified sand and gravel; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches.

The Ap horizon is 7 to 10 inches thick. It has color value of 2 or 3 and chroma of 1 to 3. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The B horizon is medium acid to neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 4.

Watseka Variant

The Watseka Variant consists of deep, somewhat poorly drained, rapidly permeable soils in old lake basins and on stream terraces. These soils formed in sandy glacial drift. Slopes range from 0 to 3 percent.

These Watseka soils are adjacent to Boyer, Chelsea, Keowns, Moundville, and Yahara soils on the landscape. Boyer soils are higher on the landscape than the Watseka soils and are better drained. Also, they have a finer textured subsoil. Chelsea soils are similar to Watseka soils but are better drained. Keowns soils are lower on the landscape than the Watseka soils and are more poorly drained. They have a loamy subsoil. Moundville soils are slightly higher on the landscape than the Watseka soils and are slightly better drained. Also, they are slightly finer textured in the main layer of the subsoil. Yahara soils have a thicker dark colored surface layer than the Watseka soils and have a loamy subsoil.

Typical pedon of Watseka Variant loamy sand, 0 to 3 percent slopes, 1,320 feet west and 200 feet south of the northeast corner of sec. 32, T. 5 N., R. 16 E.

A1—0 to 12 inches; black (10YR 2/1) loamy sand; weak fine granular structure; very friable; mildly alkaline; clear wavy boundary.

A3—12 to 18 inches; dark grayish brown (10YR 4/2) loamy sand; few fine prominent strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; very friable; mildly alkaline; gradual wavy boundary.

B2—18 to 32 inches; pale brown (10YR 6/3) sand; few fine prominent strong brown (7.5YR 5/8) and few fine faint grayish brown (10YR 5/2) mottles; single grain; very friable; mildly alkaline; clear wavy boundary.

C1—32 to 48 inches; variegated pale brown (10YR 6/3) and light gray (10YR 7/2) sand; common medium prominent yellowish brown (10YR 5/6) mottles; single grain; loose; strong effervescence; moderately alkaline; clear wavy boundary.

C2—48 to 60 inches; light gray (10YR 7/2) fine sand and thin strata of coarse silt; single grain; very friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The depth to free carbonates is 28 to 36 inches.

The A1 horizon is 10 to 18 inches thick. It has color value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 or 3. In some pedons it has subhorizons of loamy sand. Reaction ranges from neutral to moderately alkaline. The C horizon is sand, fine sand, or loamy fine sand. It has thin strata of silt, coarse silt, fine sandy loam, or very fine sand in some pedons. It is neutral to moderately alkaline and has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 3.

Wauconda series

The Wauconda series consists of deep, somewhat poorly drained, moderately permeable soils on terraces in old lake basins. These soils formed in silty material over stratified lake-laid silt and fine sand. Slopes range from 0 to 6 percent.

Wauconda soils are adjacent to Grays, Keowns, Kibbie, Lamartine, Rotamer, Theresa, and Wacousta soils on the landscape. They are similar to Grays and Wacousta soils. Grays soils are higher on the landscape than Wauconda soils and are better drained. Keowns soils are lower on the landscape and are more poorly drained. They contain more sand in the subsoil. Kibbie soils also contain more sand in the subsoil. Lamartine soils are on ground moraines and drumlins. Rotamer and Theresa soils are higher on the landscape than Wauconda soils and are better drained. They are underlain by gravelly sandy loam till. Wacousta soils are lower on the landscape than Wauconda soils and are more poorly drained.

Typical pedon of Wauconda silt loam, 0 to 2 percent slopes, 1,200 feet east and 1,250 feet north of the center of sec. 30, T. 6 N., R. 14 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 13 inches; grayish brown (2.5Y 5/2) silt loam; weak fine granular structure; friable; very dark gray (10YR 3/1) worm casts; neutral; clear smooth boundary.

B1t—13 to 22 inches; brown (10YR 5/3) silty clay loam; common fine prominent brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on all faces of peds; slightly acid; clear wavy boundary.

B21t—22 to 27 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin patchy dark grayish brown (2.5Y 4/2) clay films on all faces of peds; medium acid; clear wavy boundary.

B22t—27 to 32 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; firm; thick continuous very dark gray (10YR 3/1) clay films; slightly acid; clear wavy boundary.

B3—32 to 38 inches; grayish brown (10YR 5/2) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; neutral gradual wavy boundary.

C—38 to 60 inches; light brownish gray (2.5Y 6/2) and brownish yellow (10YR 6/8) silt stratified with fine sand; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches.

The Ap horizon is 6 to 10 inches thick and has color value of 2 or 3 and chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y and value of 4 to 6. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5,

and chroma of 2 or 3. The solum ranges from medium acid to mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 2 to 8. It is silt stratified with fine sand or very fine sand. It is mildly alkaline or moderately alkaline. Individual strata can be as thin as 1/8 inch or as thick as 2 feet.

Whalan series

The Whalan series consists of moderately deep, well drained, moderately slowly permeable soils on glaciated, bedrock-controlled uplands. These soils formed in loamy glacial drift and clayey residuum weathered from dolomite. Slopes range from 2 to 12 percent.

Whalan soils are adjacent to Fox, Kidder, Lamartine, Rotamer, Theresa, and Virgil soils on the landscape. Fox and Kidder soils are similar to Whalan soils, but Fox soils are underlain by gravelly sand or very gravelly sand and Kidder soils are underlain by gravelly sandy loam. Lamartine soils are underlain by sandy loam and are below Whalan soils on the landscape. Rotamer and Theresa soils are underlain by gravelly sandy loam. Virgil soils are underlain by sandy loam.

Typical pedon of Whalan loam, 6 to 12 percent slopes, eroded, 570 feet east and 75 feet north of the southwest corner of sec. 18, T. 6 N., R. 13 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loam; weak very fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

B1—9 to 11 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

B21t—11 to 19 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine angular and subangular blocky structure; firm; thin continuous brown (7.5YR 4/4) clay films; strongly acid; clear smooth boundary.

B22t—19 to 29 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure parting to moderate fine angular blocky; firm; thin continuous reddish brown (5YR 4/4) clay films; medium acid; clear wavy boundary.

B23t—29 to 33 inches; strong brown (7.5YR 5/6) clay loam; weak fine subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on all faces of peds; slightly acid; abrupt smooth boundary.

IIB3t—33 to 36 inches; strong brown (7.5YR 5/6) clay; moderate fine angular and subangular blocky structure; very firm; thin continuous reddish brown (5YR 4/3) clay films; about 2 percent coarse fragments by volume; slightly acid; abrupt wavy boundary.

R—36 inches; light yellowish brown (10YR 6/4) creviced dolomite.

The thickness of the solum, or the depth to bedrock, ranges from 20 to 40 inches.

The Ap horizon has color value of 2 to 4 and chroma of 1 to 3. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. In some pedons the IIB horizon has hue of 5YR. The solum ranges from strongly acid to mildly alkaline. In most places, the R horizon is creviced and material from the IIB horizon fills the crevices in the upper part.

Whalan Variant

The Whalan Variant consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on terraces and foot slopes at the base of drumlins where dolomite is near the surface. These soils formed in loamy glacial drift and clayey residuum weathered from dolomite. Slopes range from 0 to 3 percent.

These Whalan soils are adjacent to Barry, Kidder, Lamartine, Palms, Theresa, and Wacousta soils and to other Whalan soils. Barry and Wacousta soils are below the Whalan Variant on the landscape and are more poorly drained. They have a loamy substratum. Kidder and Theresa soils are higher on the landscape than the Whalan Variant and are underlain by glacial till. The somewhat poorly drained Lamartine soils also are underlain by glacial till. Palms soils are lower on the landscape than the Whalan Variant and formed in organic material. The other Whalan soils are similar to these Whalan soils but are better drained.

Typical pedon of Whalan Variant silt loam, 0 to 3 percent slopes, 1,250 feet west and 100 feet south of the northeast corner of sec. 24, T. 5 N., R. 14 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 5/3) sandy loam; few fine prominent brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21t—12 to 18 inches; brown (10YR 4/3) loam; few fine prominent brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable; thin patchy dark brown (10YR 3/3) clay films on all faces of peds; slightly acid; clear wavy boundary.

B22t—18 to 22 inches; yellowish brown (10YR 5/4) clay loam; common fine prominent yellowish brown (10YR 5/8) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films on all faces of peds; strongly acid; clear wavy boundary.

IIB23t—22 to 27 inches; dark yellowish brown (10YR 4/4) clay; common medium prominent brownish yellow (10YR 6/8) and common medium distinct grayish brown (10YR 5/2) mottles; moderate very fine angular blocky structure; very firm; thin continuous dark brown (10YR 3/3) clay films on all faces of peds; slightly acid; abrupt wavy boundary.

R—27 inches; light gray (10YR 7/2) creviced dolomite.

The thickness of the solum, or the depth to bedrock, ranges from 20 to 40 inches.

The Ap horizon is 6 to 10 inches thick and has color value of 2 or 3 and chroma of 1 to 3. The A2 horizon is 2 to 6 inches thick unless it has been mixed with the Ap horizon by plowing. It has color value of 4 to 6 and chroma of 2 or 3. The B horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 3 or 4. It ranges from strongly acid to mildly alkaline. In most places, the R horizon is creviced and material from the IIB horizon fills the crevices in the upper part.

Yahara series

The Yahara series consists of deep, somewhat poorly drained, moderately permeable soils on terraces in old lake basins. These soils formed in loamy material over stratified silt and fine sand. Slopes range from 0 to 3 percent.

Yahara soils are adjacent to Adrian, Chelsea, Keowns, Moundville, and Salter soils. Adrian soils are below Yahara soils on the landscape and are organic in the upper part. Chelsea and Moundville soils are higher on the landscape and are better drained. Keowns and Salter soils are similar to Yahara soils, but Salter soils are higher on the landscape, are better drained, and have a

thinner, lighter colored surface layer and Keowns soils are lower on the landscape and are more poorly drained.

Typical pedon of Yahara fine sandy loam, 0 to 3 percent slopes, 1,000 feet west and 200 feet north of the southeast corner of SW1/4 sec. 3, T. 8 N., R. 14 E.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A3—9 to 15 inches; black (10YR 2/1) fine sandy loam; moderate fine granular structure; very friable; slightly acid; clear smooth boundary.

B1—15 to 18 inches; dark brown (10YR 4/3) fine sandy loam; common fine faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; many black (10YR 2/1) earthworm casts; slightly acid; clear wavy boundary.

B2—18 to 24 inches; brown (10YR 5/3) fine sandy loam; common medium faint light brownish gray (10YR 6/2) and common fine faint dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; friable; few patchy organic stains on vertical faces of some peds; mildly alkaline; clear wavy boundary.

C1—24 to 36 inches; yellowish brown (10YR 5/4) fine sand; common medium distinct grayish brown (10YR 5/2) and common fine faint dark brown (7.5YR 4/4) mottles; single grained; very friable; slight effervescence; moderately alkaline; clear wavy boundary.

C2—36 to 60 inches; light gray (10YR 7/1) and pale brown (10YR 6/3) stratified silt and fine sand; common fine prominent dark yellowish brown (10YR 4/4) mottles; very friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches, and the depth to free carbonates is 20 to 30 inches.

The A horizon has color value of 2 or 3 and chroma of 1 to 3. The B horizon is dominantly fine sandy loam or very fine sandy loam, but some subhorizons are fine sand or loamy fine sand. Color value is 4 to 6, and chroma is 3 to 6. The B horizon ranges from slightly acid to mildly alkaline in the upper part and from neutral to moderately alkaline in the lower part. Individual layers in the stratified C horizon range widely in thickness. Thin strata of medium sand or clay are in some pedons. The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 to 6.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*10*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Flu*, meaning flood plain, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Udifluvents (*Ud*, meaning udic moisture regime, plus *fluvents*, the suborder of Entisols that are on flood plains).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Udifluvents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-silty, mixed, nonacid, mesic Typic Udifluvents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the Soils

This section describes the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation.

Factors of soil formation

The factors that determine the kind of soil that forms at any given point are the composition of the parent material; the climate under which the soil material has accumulated and weathered; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material (7).

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They alter the accumulated material and bring about the development of genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of profile that can form and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent material

Parent material is the unconsolidated mass from which a soil forms. It largely determines the chemical and mineralogical composition of the soil.

Most of the soils in Jefferson County are derived from parent material that was directly or indirectly influenced by the glacier. Even the soils that formed in material that weathered over bedrock show some glacial influence in rounded pebbles of mixed origin. Examples are the Whalan soils that are on dolomite ridges and side slopes. Adrian, Edwards, Houghton, and Palms soils, which formed in decomposed organic material, are very poorly drained as a result of the damming of earlier drainageways by glacial debris. The most common parent material is loess, glacial till, glacial outwash, organic material, and lacustrine deposits. The less common parent material is alluvium, windblown sand, and residuum derived from dolomite.

Loess, or windblown silt, is the parent material of the upper part of many soils in Jefferson County. Some of the most productive soils formed in windblown silt and in the underlying glacial till. Dodge, McHenry, Ringwood, St. Charles, and Theresa soils formed partly in this silt.

Glacial till is unstratified, unsorted glacial debris that consists of sand, silt, clay, gravel, and boulders. Most of the till is gravelly sandy loam or sandy loam. The content of coarse fragments ranges, by volume, from 5 to about 35 percent. Igneous boulders as much as 4 feet in diameter are not uncommon. Stone piles of the coarse fragments left on the surface by the glacier are common in the areas where the soils are underlain by glacial till. Barry, Dodge, Griswold, Kidder, McHenry, Rotamer, St. Charles, and Theresa soils formed partly in glacial till or are underlain by glacial till.

Glacial outwash is material deposited by water flowing from the melting glacier. The most valuable deposits are stratified sand and gravel. Some of the sandy outwash contains little or no gravel. Boyer, Casco, Fox, Lorenzo, Matherton, and Wasepi soils are underlain by stratified sand and gravel outwash. Moundville soils formed in sandy outwash.

Organic material is the parent material of numerous soils in the county. It consists of mainly sedges, reeds, and grasses in various stages of decomposition. Adrian and Palms soils formed in 16 to 50 inches of organic material and are underlain by mineral soil material. Houghton soils formed in more than 50 inches of organic material. Edwards soils formed in 16 to 50 inches of organic material and are underlain by marl.

Lacustrine deposits consist of mostly stratified silt and fine sand, but some deposits in the central and southern parts of the county are clayey. These are sedimentary deposits that were laid down in the still water of old glacial lakes. Keowns, Kibbie, and Sisson soils are underlain by stratified silt and fine sand or very fine sand. Aztalan, Hebron, and Saylesville soils formed partly or entirely in clayey and silty lacustrine deposits.

Alluvial deposits are of recent origin, and the soils that formed in these deposits do not have distinct horizons. This material is mostly silty and is deposited on stream bottoms and foot slopes by stream flood water or is locally washed from higher positions on the landscape. Fluvaquents and Juneau and Otter soils formed in alluvial deposits. Radford soils are on foot slopes and along natural drainageways where 20 to 40 inches of silty alluvium and colluvium overlies a buried soil.

Windblown sand is mostly fine and medium in size. The finer the particle size, the more readily the sand can be moved by the wind. Chelsea soils commonly formed in thick deposits of windblown sand.

Residuum weathered from dolomite is another parent material in the county. Dolomite weathers to a firm and plastic, fine textured or moderately fine textured residuum. In most places only a thin layer of the residuum overlies the dolomite. Whalan soils formed partly in glacial till and in residuum weathered from dolomite.

Many of the soils in Jefferson County formed in two or more kinds of parent material. The Grellton soil, for example, formed in three kinds of parent material. The upper part formed in a loamy mantle; the middle part in windblown silt; and, in some areas, the lower part in sandy loam glacial till.

Climate

Climate affects soil formation through the effects of moisture and heat. It directly affects the weathering of rocks and the alteration of parent material through the mechanical action of freezing and thawing and the chemical action generated by percolating water. It indirectly affects soil formation through its influence on plant and animal life. Differences in climate within the survey area are too small to result in great differences among the soils.

Plant and animal life

Plants and animals in and on the soil provide organic matter and mix the soil material. They bring plant nutrients from the lower horizons to the upper horizons.

The influence of different kinds of vegetation on the formation of soils is shown by the differences in color between the soils that formed under trees and those that formed under prairie grasses. Dodge, Kidder, and Theresa soils formed under trees, and they have a lighter colored or thinner surface layer than soils formed under grass and are generally more acid. Griswold, Lorenzo, and Ringwood soils formed under grass and have a thick, dark colored surface layer. Soils that formed under grass accumulate more organic matter and retain it longer than soils that formed under trees. The surface layer is darker because of the humus. Soils that formed in places where the vegetation is a mixture of trees and grasses generally have characteristics of both woodland and prairie soils.

Relief

The hills, valleys, terraces, and plains in Jefferson County formed through the action of rain, rivers, winds, glacial ice, and glacial meltwater over a long period. In areas where bedrock controls the topography, the resistance or lack of resistance of the underlying rocks has determined the relief. Relief, in turn, influences soil formation by controlling drainage, runoff, and other direct or indirect effects of water, including erosion. In many places the relief of a given soil can be correlated closely with the drainage, the thickness and organic-matter content of the A1 horizon, the thickness of the solum, and the differentiation of horizons in the soil profile.

In Jefferson County the surface layer is generally light colored in the more sloping soils and is successively darker and thicker in the more gently sloping soils. Runoff is slower, and more water soaks into the soil. As a result, plants grow better on the gentler slopes and more organic matter accumulates in the A1 horizon.

The relationship of relief to soil formation is shown by the general pattern of thin soils where slopes are steep and of progressively better developed, deeper soils where slopes are gentler. The deeper soils contain more clay in the subsoil than the thin, immature soils. Boyer and Rodman soils show the influence of relief on soil formation. These soils are underlain by the same kind of material, but the generally more sloping Rodman soils lack the clay accumulation and well defined structure in the B horizon characteristic of the deeper, more gently sloping Boyer soils.

Drainage characteristics are generally reflected in the color, degree, and kind of mottling or gleying in the soil profile. The well drained Dodge, Griswold, and McHenry soils have no mottles in the solum. Grellton and Kidder soils are well drained and moderately well drained. In many areas where these soils are nearly level or gently sloping, mottles are in the lower part of the B horizon.

Aztalan, Kibbie, Lamartine, and Yahara soils are somewhat poorly drained. They are mottled in the B and C horizons. Barry, Keowns, Milford, and Otter soils are poorly drained or very poorly drained. They are generally mottled and gleyed in the B and C horizons.

Time

Time has had some effect on the differences among the soils in the survey area. For example, new sediments are added on the surface of Otter soils on stream bottoms during periods of flooding. These soils do not have distinct horizons because the soil material has not been in place long enough for the soil-forming processes to have a full effect. In contrast, the well drained soils, for example Dodge soils, that formed in glacial till and in windblown silt have well defined horizons because the processes have been active since the last period of glaciation.

Use and management of soils have had such an important effect on soil formation, especially during the past 125 years, that they have been called a sixth factor of soil formation. They have altered the natural soil-forming processes.

Clearing, burning, and cultivating have greatly altered the original condition of many soils. Repeated removal of plant cover from terraces and uplands has accelerated erosion. Overcultivation has contributed to the loss of organic matter. The infiltration rate has been reduced. Overcultivation and the use of heavy equipment have made the loose, porous surface layer cloddy.

In areas where good management has been applied and suitable crop rotations have been used, the soil has not been harmed and crop yields have gradually increased. Additions of animal manure and the growth of such grasses as bromegrass have increased the organic-matter content in the surface layer and the upper part of the subsoil beyond the natural level of woodland soils.

Liming has altered the natural acidity of the soils. It not only has improved plant growth but also has created a more favorable environment for soil bacteria. The increased bacterial action, in turn, has hastened the decomposition of organic matter, which darkens the cultivated part of many soils.

Applications of fertilizer have increased the supply of plant nutrients. Growing alfalfa, which has a long tap root, has transferred calcium and other plant food elements from the lower part of the subsoil and the substratum to the surface layer.

Waterways and water-control structures have improved drainage. Drainage of wetlands has permitted cultivation of many soils having a high potential for growing crops but has contributed to a general lowering of the water table throughout the survey area.

The effects of land use are evident in areas where the plow layer is mostly brown material from the subsoil. Soil loss is also apparent in the overly thick surface layer in some soils on foot slopes and along natural drainageways, where sediments washed from the surrounding soils are 2 to 3 feet or more thick. Radford soils formed in sediments overlying an older, buried soil.

Other effects of manipulation of the soil and the landscape include more flash flooding where woodland cover is removed from the more sloping soils of the watershed; rapid filling of lakes and reservoirs with sediments; contamination of ground water with sewage effluent and fertilizer elements, especially nitrates; and the effects of pesticides on soil organisms and ground water. Some of the effects will not be evident for many years.

Processes of soil formation

A combination of basic processes is responsible for horizon differentiation. These processes can be active in all soils. The four main processes are *gains, losses, transfers*, and *transformations*. Some changes promote horizon differentiation, and others retard or offset horizon differentiation. The balance among the changes determines the nature of the soil at any given point.

Dodge soils show how these soil-forming processes interact. The parent material of these soils was calcareous gravelly sandy loam till and windblown silt loam. The silt loam was probably deposited over the till during and after the glacial period. Because these soils are high on the landscape and are underlain by porous till, they are well drained. The climate favored the growth of plants. Plants and animals contributed to the accumulation of organic matter and organic acids, and they mixed the soil to some extent. These processes accelerated as more and higher forms of organisms grew in the soil and produced a greater volume of organic residue and acids.

Free lime in the soil material gradually dissolves and is moved downward by water percolating into the lower part of the soil. As the water moves downward, suspended particles of clay are translocated. As a result, Dodge soils have more clay in the lower part of the silty layer and the upper part of the glacial till than in the other parts. While the clay moved downward, organic matter in various stages of decomposition accumulated at or near the surface. As a result of this decomposed organic matter, the surface layer has a darker color than it originally had.

While these changes occurred in the silty part of the soil, the loamy lower part formed in till that is of mixed mineralogy and contains a significant amount of coarse fragments, including dolomite. Chemical weathering of the dolomite and other weatherable minerals gradually changed this layer to a mixture of gravel and sandy loam. As a result of oxidized iron, which occurs as impurities in the dolomite, this layer has a darker color than the underlying unweathered till.

As a result of these soil-forming processes, the Dodge soils have a surface layer of silt loam and a subsoil that is silty clay loam in the upper part and strong brown clay loam in the lower part. They are underlain by unweathered, mildly alkaline till at a depth of about 38 inches. This till has changed little since it was deposited by the glacier.

The processes that were active in the formation of Dodge soils were *gains* of organic matter in the surface layer, *loss* of clay from the upper part of the soil and subsequent *transfer* to the lower part, and *transformation* of iron compounds in the lower part of the subsoil.

All of these processes are active in all soils in the survey area. The kinds of parent material and the relief have, to a great extent, determined the kinds of processes that are dominant in the formation of the soils, and they have caused differences among the soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Organic matter. A general term for plant and animal remains, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition. The terms used to describe the content of organic matter in the upper 10 inches of the soils in Jefferson County are *very low* (less than 0.5 percent), *low* (0.5 to 1.0 percent), *moderately low* (1.0 to 2.0 percent), *moderate* (2.0 to 4.0 percent), *high* (4.0 to 8.0 percent), and *very high* (more than 8 percent).

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the basis of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal difference, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope groups used in Jefferson County are *nearly level* (0 to 2 percent), *gently sloping* (2 to 6 percent), *sloping* (6 to 12 percent), *moderately steep* (12 to 20 percent), and *steep* (20 to 30 percent). The slope letters for these groups are, respectively, A, B, C, D, and E.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Illustrations

Figure 1.—Exposure of dolomite underlying Whalan loam, 2 to 6 percent slopes.

Figure 2.—Landscape of the Kidder-McHenry-Rotamer map unit. Kidder soils are in the foreground, McHenry soils in the middle, and Rotamer soils on the drumlin in the background.

Figure 3.—Carrots on Houghton muck. This soil has good potential for specialty crops.

Figure 4.—Diverison on Virgil soils. Diversions intercept runoff from nearby slopes.

Figure 5.—Septic tank absorption field in Boyer sandy loam, 1 to 6 percent slopes.

Figure 6.—Stratified sand and gravel outwash. These deposits are a good source of construction aggregate.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[All data from Fort Atkinson, Wisconsin, based on records from 1942 to 1959]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	2 years in 10 will have monthly average of at least-- Maximum temperature equal to or higher than--	2 years in 10 will have monthly average of at least-- Minimum temperature equal to or lower than--	Average monthly total	1 year in 10 will have-- Less than--	1 year in 10 will have-- More than--	Days with 0.1 inch or more	Average precipitation in the form of snow and sleet
	°F	°F	°F	°F	In	In	In		In
January---	28.5	11.0	24	14	1.32	0.35	2.15	3	9.2
February--	31.6	14.4	27	18	0.97	0.17	1.64	3	4.5
March-----	41.7	24.5	37	29	1.79	1.17	2.73	5	7.1
April-----	58.5	36.5	51	43	2.68	1.15	3.61	6	0.4
May-------	69.1	46.6	61	55	3.18	1.62	4.59	7	0.1
June------	78.2	57.5	71	63	3.87	2.43	5.52	8	0.0
July------	83.1	61.5	74	70	3.90	1.80	7.00	6	0.0
August----	81.9	60.4	75	67	3.37	1.53	4.61	6	0.0
September-	73.8	51.7	65	59	3.03	0.90	4.80	6	(1/)
October---	63.6	41.5	56	48	2.02	0.45	3.62	4	0.1
November--	44.8	28.4	41	30	2.05	0.73	3.28	5	2.7
December--	31.9	16.4	29	18	1.58	0.85	2.20	5	8.0
Year---	57.2	37.5	74	14	29.76	25.18	36.38	64	32.1

1/ Trace.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[All data are from Fort Atkinson, Wisconsin, based on records from 1942 to 1959]

Probability	Minimum temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
2 years in 10 later than--	Mar. 28	Apr. 6	Apr. 17	May 1	May 14
4 years in 10 later than--	Mar. 20	Mar. 30	Apr. 9	Apr. 24	May 7
6 years in 10 later than--	Mar. 14	Mar. 23	Apr. 3	Apr. 18	May 1
8 years in 10 later than--	Mar. 6	Mar. 15	Mar. 26	Apr. 11	Apr. 24
Fall:					
2 years in 10 earlier than--	Nov. 7	Oct. 30	Oct. 21	Oct. 13	Sept. 25
4 years in 10 earlier than--	Nov. 15	Nov. 7	Oct. 29	Oct. 21	Oct. 2
6 years in 10 earlier than--	Nov. 21	Nov. 13	Nov. 4	Oct. 28	Oct. 8
8 years in 10 earlier than--	Nov. 29	Nov. 21	Nov. 12	Nov. 4	Oct. 15

TABLE 3.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ad	Adrian muck	8,935	2.4
AzA	Aztalan fine sandy loam, 0 to 3 percent slopes	7,520	2.0
BaA	Barry silt loam, 0 to 3 percent slopes	1,755	0.5
BoC	Boyer loamy sand, 6 to 12 percent slopes	2,115	0.6
BpB	Boyer sandy loam, 1 to 6 percent slopes	7,055	1.9
CaB2	Casco loam, 2 to 6 percent slopes, eroded	950	0.3
CaC2	Casco loam, 6 to 12 percent slopes, eroded	4,555	1.2
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded	4,600	1.2
CrE	Casco-Rodman complex, 20 to 45 percent slopes	1,490	0.4
CtB	Chelsea loamy fine sand, 1 to 6 percent slopes	1,005	0.3
CtC	Chelsea loamy fine sand, 6 to 20 percent slopes	850	0.2
DcA	Del Rey silt loam, 0 to 3 percent slopes	3,530	0.9
DdB	Dodge silt loam, 2 to 6 percent slopes	3,550	0.9
Ed	Edwards muck	805	0.2
Ev	Elvers silt loam	450	0.1
Fn	Fluvaquents	3,455	0.9
FoC2	Fox loam, 6 to 12 percent slopes, eroded	4,330	1.2
FsA	Fox silt loam, 0 to 2 percent slopes	3,655	1.0
FsB	Fox silt loam, 2 to 6 percent slopes	12,870	3.4
Gd	Gilford sandy loam	1,720	0.5
GsB	Grays silt loam, 2 to 6 percent slopes	720	0.2
GtB	Grellton fine sandy loam, 2 to 6 percent slopes	1,345	0.4
GwB	Griswold sandy loam, 2 to 6 percent slopes	610	0.2
GwC2	Griswold sandy loam, 6 to 12 percent slopes, eroded	375	0.1
HeB	Hebron loam, 1 to 6 percent slopes	2,780	0.7
Ht	Houghton muck	28,915	7.7
JuB	Juneau silt loam, 1 to 6 percent slopes	1,390	0.4
Kb	Keowns silt loam	14,675	3.9
KdA	Kibbie fine sandy loam, 0 to 3 percent slopes	5,175	1.4
KeB	Kidder sandy loam, 2 to 6 percent slopes	5,670	1.5
KeC2	Kidder sandy loam, 6 to 12 percent slopes, eroded	3,730	1.0
KfB	Kidder loam, 2 to 6 percent slopes	11,900	3.2
KfC2	Kidder loam, 6 to 12 percent slopes, eroded	15,505	4.1
KfD2	Kidder loam, 12 to 20 percent slopes, eroded	5,625	1.5
KgB	Kidder loam, moderately well drained, 2 to 6 percent slopes	3,155	0.8
LaB	Lamartine silt loam, 2 to 6 percent slopes	14,645	3.9
LyB	Lorenzo sandy loam, 2 to 6 percent slopes	300	0.1
MgA	Martinton silt loam, 0 to 2 percent slopes	2,440	0.6
MgB	Martinton silt loam, 2 to 6 percent slopes	2,260	0.6
MmA	Matherton silt loam, 0 to 3 percent slopes	9,210	2.5
MnA	Matherton silt loam, clayey substratum, 0 to 3 percent slopes	3,585	1.0
MoB	Mayville silt loam, 2 to 6 percent slopes	4,665	1.2
MpB	McHenry silt loam, 2 to 6 percent slopes	7,005	1.9
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded	5,585	1.5
Mr	Milford silty clay loam	11,885	3.2
MvB	Moundville loamy sand, 1 to 6 percent slopes	1,620	0.4
Ot	Otter silt loam	1,965	0.5
Pa	Palms muck	14,275	3.8
Pb	Palms muck, ponded	2,530	0.7
Pg	Pits, gravel	340	0.1
RaA	Radford silt loam, 0 to 3 percent slopes	1,790	0.5
RnB	Ringwood silt loam, 2 to 6 percent slopes	620	0.2
RtB	Rotamer loam, 2 to 6 percent slopes	1,865	0.5
RtC2	Rotamer loam, 6 to 12 percent slopes, eroded	7,125	1.9
RtD2	Rotamer loam, 12 to 20 percent slopes, eroded	5,605	1.5
RtE2	Rotamer loam, 20 to 30 percent slopes, eroded	1,895	0.5
SbA	St. Charles silt loam, moderately well drained, 0 to 2 percent slopes	1,325	0.4
SbB	St. Charles silt loam, moderately well drained, 2 to 6 percent slopes	4,140	1.1
SfB	St. Charles silt loam, moderately well drained, gravelly substratum, 2 to 6 percent slopes	2,440	0.6
ShB	Salter loamy sand, 2 to 6 percent slopes	465	0.1
SkB	Saylesville silt loam, 2 to 6 percent slopes	1,990	0.5
SlC2	Saylesville silty clay loam, 6 to 12 percent slopes, eroded	435	0.1
Sm	Sebewa silt loam	7,920	2.1
Sn	Sebewa silt loam, clayey substratum	6,565	1.8
SoB	Sisson fine sandy loam, 1 to 6 percent slopes	1,555	0.4
SoC2	Sisson fine sandy loam, 6 to 12 percent slopes, eroded	685	0.2
ThB	Theresa silt loam, 2 to 6 percent slopes	1,580	0.4
ThC2	Theresa silt loam, 6 to 12 percent slopes, eroded	3,145	0.8
TuA	Tuscola silt loam, 0 to 2 percent slopes	1,060	0.3
TuB	Tuscola silt loam, 2 to 6 percent slopes	2,640	0.7
Ud	Udorthents	385	0.1

TABLE 3.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
VrB	Virgil silt loam, 2 to 6 percent slopes	3,255	0.9
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	2,095	0.6
Wa	Wacousta silty clay loam	17,785	4.8
WmA	Wasepi sandy loam, 0 to 3 percent slopes	3,390	0.9
WtA	Watseka Variant loamy sand, 0 to 3 percent slopes	3,030	0.8
WvA	Wauconda silt loam, 0 to 2 percent slopes	4,915	1.3
WvB	Wauconda silt loam, 2 to 6 percent slopes	2,860	0.8
WxB	Whalan loam, 2 to 6 percent slopes	2,415	0.6
WxC2	Whalan loam, 6 to 12 percent slopes, eroded	705	0.2
WyA	Whalan Variant silt loam, 0 to 3 percent slopes	345	0.1
YaA	Yahara fine sandy loam, 0 to 3 percent slopes	5,860	1.5
	Water	13,440	3.6
	Total	374,400	100.0

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1976. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
Ad------------------------ Adrian	75	10	---	2.4	3.0
AzA----------------------- Aztalan	105	17	70	4.5	3.0
BaA----------------------- Barry	95	16	80	3.8	3.0
BoC----------------------- Boyer	65	11	45	2.6	2.0
BpB----------------------- Boyer	80	13	60	3.4	---
CaB2---------------------- Casco	70	12	55	2.7	3.0
CaC2---------------------- Casco	65	11	50	2.5	2.5
CrD2---------------------- Casco-Rodman	---	---	40	2.0	2.5
CrE----------------------- Casco-Rodman	---	---	---	---	1.5
CtB----------------------- Chelsea	55	9	40	2.0	2.0
CtC----------------------- Chelsea	---	---	35	1.5	1.5
DcA----------------------- Del Rey	105	17	65	4.5	3.5
DdB----------------------- Dodge	105	17	75	5.0	3.0
Ed------------------------ Edwards	90	15	---	3.0	3.0
Ev------------------------ Elvers	115	19	55	2.5	3.0
Fn*. Fluvaquents					
FoC2---------------------- Fox	80	13	65	2.5	2.5
FsA----------------------- Fox	90	15	75	3.0	3.0
FsB----------------------- Fox	85	14	70	3.0	3.0
Gd------------------------ Gilford	120	20	100	4.0	3.0
GsB----------------------- Grays	110	17	70	4.5	4.0
GtB----------------------- Grellton	115	19	25	5.5	3.0

See footnote at end of table.

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
GwB----------------------- Griswold	105	17	70	3.8	3.5
GwC2---------------------- Griswold	90	15	60	3.5	2.5
HeB----------------------- Hebron	110	18	70	4.5	3.0
Ht------------------------ Houghton	115	19	---	3.0	3.0
JuB----------------------- Juneau	105	17	55	4.5	3.5
Kb------------------------ Keowns	90	15	60	3.0	3.0
KdA----------------------- Kibbie	110	18	65	4.0	3.0
KeB----------------------- Kidder	90	15	60	3.5	2.7
KeC2---------------------- Kidder	75	12	55	3.0	2.5
KfB----------------------- Kidder	100	17	70	4.0	3.0
KfC2---------------------- Kidder	85	14	65	3.5	2.7
KfD2---------------------- Kidder	75	12	55	3.0	2.5
KgB----------------------- Kidder	100	17	70	4.0	3.0
LaB----------------------- Lamartine	115	19	65	4.5	3.0
LyB----------------------- Lorenzo	75	12	50	3.0	2.0
MgA----------------------- Martinton	115	19	75	4.8	3.0
MgB----------------------- Martinton	115	19	70	4.6	3.0
MmA----------------------- Matherton	105	17	80	4.1	3.0
MnA----------------------- Matherton	100	17	70	3.5	3.5
MoB----------------------- Mayville	100	17	70	4.5	3.0
MpB----------------------- McHenry	100	17	70	5.0	3.0
MpC2---------------------- McHenry	85	14	65	4.5	2.7
Mr------------------------ Milford	115	19	70	4.8	3.0
MvB----------------------- Moundville	60	10	50	2.5	1.5

See footnote at end of table.

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
Ot----------------------- Otter	120	20	50	4.0	3.0
Pa----------------------- Palms	105	17	---	---	3.0
Pb----------------------- Palms	110	18	---	3.5	3.5
Pg*. Pits					
RaA---------------------- Radford	120	20	70	5.0	3.5
RnB---------------------- Ringwood	110	18	70	4.6	3.5
RtB---------------------- Rotamer	80	13	60	4.0	3.0
RtC2--------------------- Rotamer	70	11	50	3.5	2.7
RtD2--------------------- Rotamer	60	10	40	3.0	2.5
RtE2--------------------- Rotamer	---	---	30	2.0	2.3
SbA---------------------- St. Charles	125	20	70	5.0	3.5
SbB---------------------- St. Charles	120	20	65	5.5	3.5
SfB---------------------- St. Charles	125	20	65	5.5	3.5
ShB---------------------- Salter	90	15	65	4.0	3.0
SkB---------------------- Saylesville	120	20	70	5.0	3.0
SlC2--------------------- Saylesville	110	18	65	4.5	2.7
Sm----------------------- Sebewa	105	17	60	4.0	3.0
Sn----------------------- Sebewa	105	16	60	4.5	1.5
SoB---------------------- Sisson	105	17	70	5.0	3.5
SoC2--------------------- Sisson	90	15	60	4.5	3.0
ThB---------------------- Theresa	105	17	70	5.0	3.0
ThC2--------------------- Theresa	90	15	60	4.5	2.7
TuA---------------------- Tuscola	110	18	85	3.2	4.0

See footnote at end of table.

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
TuB: Tuscola	100	17	80	3.2	4.0
Ud*. Udorthents					
VrB: Virgil	125	21	74	5.0	3.5
VwA: Virgil	140	22	85	4.5	3.5
Wa: Wacousta	100	17	80	4.0	2.0
WmA: Wasepi	80	12	60	3.0	2.8
WtA: Watseka Variant	55	9	55	3.4	2.0
WvA: Wauconda	110	18	73	4.7	5.0
WvB: Wauconda	110	17	72	4.7	5.0
WxB: Whalan	80	12	60	4.0	3.0
WxC2: Whalan	65	9	49	3.0	2.0
WyA: Whalan Variant	90	14	75	3.5	3.5
YaA: Yahara	80	13	60	3.5	3.0

* See map unit description for the composition and behavior of the map unit.

TABLE 5.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	4,480	---	---	---
II	185,265	103,975	82,620	3,655
III	110,515	38,694	66,485	7,055
IV	31,885	16,490	12,770	2,625
V	5,985	---	5,985	---
VI	7,345	4,885	---	2,460
VII	1,490	894	---	596
VIII	---	---	---	---

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Important trees	Site index	Trees to plant
Ad Adrian	3w	Severe	Severe	Severe	Severe	Red maple Silver maple White ash Quaking aspen	55 --- --- ---	
AzA Aztalan	4o	Slight	Slight	Moderate	Moderate	Silver maple American elm	70 ---	Norway spruce, white spruce, whitebark pine.
BaA Barry	4w	Severe	Severe	Moderate	Severe	Red maple White ash Silver maple Quaking aspen	50 --- --- ---	White spruce, white ash, red maple.
BoC, BpB Boyer	3o	Slight	Slight	Slight	Moderate	Northern red oak White oak American basswood Sugar maple	60 --- --- ---	Eastern white pine, red pine.
CaB2, CaC2 Casco	3s	Slight	Slight	Slight	Slight	Northern red oak Black oak White oak	55 --- ---	Red pine, eastern redcedar, jack pine.
CrD2*:								
Casco	3s	Moderate	Moderate	Slight	Slight	Northern red oak Black oak White oak	55 --- ---	Red pine, eastern redcedar, jack pine.
Rodman	4f	Moderate	Severe	Slight	Slight	Northern red oak White oak	45 ---	Red pine, eastern white pine, eastern redcedar, jack pine.
CrE*:								
Casco	3s	Severe	Moderate	Slight	Slight	Northern red oak Black oak White oak	55 --- ---	Red pine, eastern redcedar, jack pine.
Rodman	4f	Severe	Severe	Slight	Slight	Northern red oak White oak	45 ---	Red pine, eastern white pine, eastern redcedar, jack pine.
CtB, CtC Chelsea	3s	Slight	Moderate	Slight	Slight	Northern pin oak Black oak White oak	55 --- ---	Eastern white pine, red pine, jack pine.
DcA Del Rey	2c	Moderate	Slight	Slight	Slight	Northern red oak Green ash Bur oak	65 --- ---	Green ash, eastern white pine, red pine, white spruce.
DdB Dodge	2o	Slight	Slight	Slight	Moderate	Northern red oak Black cherry White oak	65 --- ---	Eastern white pine, red pine, white spruce.
Ed Edwards	3w	Severe	Severe	Severe	Severe	Red maple White ash Green ash Tamarack	55 --- --- ---	
Ev Elvers	4w	Severe	Severe	Severe	Severe	Silver maple White ash	70 ---	Silver maple, white ash.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Important trees	Site index	Trees to plant
FoC2, FsA, FsB----- Fox	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Sugar maple---------	65 --- ---	Red pine, eastern white pine, white spruce, Norway spruce.
Gd----------------- Gilford	4w	Severe	Severe	Moderate	Severe	Silver maple-------- Red maple----------- White ash-----------	70 --- ---	Eastern white pine, silver maple, white spruce, eastern cottonwood, white ash.
GsB---------------- Grays	1o	Slight	Slight	Slight	Moderate	Northern red oak---- Sugar maple--------- White ash-----------	72 --- ---	Eastern white pine, red pine, white spruce.
GtB---------------- Grellton	1o	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Sugar maple--------- White ash----------- Green ash-----------	70 --- --- --- ---	Red pine, eastern white pine, white spruce.
GwB, GwC2---------- Griswold	---	--------	--------	--------	--------	--------------------	---	Black walnut, eastern white pine, red pine, green ash, northern red oak.
HeB---------------- Hebron	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Bur oak------------- American basswood--- Sugar maple---------	65 --- --- --- ---	Red pine, eastern white pine, white spruce.
Ht----------------- Houghton	3w	Severe	Severe	Severe	Severe	Red maple----------- Silver maple-------- White ash----------- Quaking aspen------- Tamarack------------	55 --- --- ---	
JuB---------------- Juneau	2o	Slight	Slight	Slight	Moderate	Northern red oak---- Sugar maple--------- American basswood---	65 --- ---	Red pine, eastern white pine, white spruce.
Kb----------------- Keowns	1w	Severe	Moderate	Moderate	Severe	Silver maple-------- Red maple----------- White ash-----------	95 90 80	Silver maple, red maple, white ash.
KdA---------------- Kibbie	1o	Moderate	Slight	Slight	Severe	Sugar maple--------- Northern red oak---- White oak----------- White ash----------- American basswood---	66 --- --- --- ---	White spruce, eastern white pine, white spruce.
KeB, KeC2, KfB, KfC2-------------- Kidder	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
KfD2--------------- Kidder	2r	Moderate	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
KgB---------------- Kidder	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
LaB---------------- Lamartine	2o	Slight	Slight	Slight	Moderate	Northern red oak---- American basswood--- Sugar maple---------	65 --- ---	Eastern white pine, red pine, white spruce.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
LyB----------------- Lorenzo	3d	Slight	Slight	Moderate	Slight	Northern red oak---- Black oak----------- White oak-----------	55 --- ---	Red pine, eastern white pine.
MgA, MgB----------- Martinton	4o	Slight	Slight	Slight	Slight	White ash----------- Red maple-----------	50 ---	Eastern white pine, red pine, Scotch pine, eastern redcedar.
MmA, MnA----------- Matherton	3o	Slight	Slight	Slight	Slight	Northern red oak---- Swamp white oak----- White oak----------- Bitternut hickory--- White ash-----------	60 --- --- --- ---	White spruce, eastern white pine, white ash, red maple.
MoB----------------- Mayville	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White ash----------- American basswood--- White oak----------- Silver maple-------- Bitternut hickory---	65 --- --- --- --- ---	Red pine, eastern white pine, white spruce.
MpB, MpC2---------- McHenry	2o	Slight	Slight	Slight	Moderate	Northern red oak---- Bur oak------------- Black cherry--------	65 --- ---	Eastern white pine, red pine.
Mr------------------ Milford	4w	Severe	Moderate	Severe	Severe	Red maple----------- Silver maple-------- White ash----------- Swamp white oak-----	45 --- --- ---	White ash, silver maple, red maple.
MvB----------------- Moundville	3s	Slight	Moderate	Slight	Moderate	Red pine------------ Jack pine----------- Northern pin oak----	53 --- ---	Red pine, jack pine.
Ot------------------ Otter	2w	Severe	Moderate	Moderate	Severe	Silver maple-------- White ash-----------	80 ---	Green ash, silver maple, eastern cottonwood, white ash.
Pa, Pb-------------- Palms	3w	Severe	Severe	Severe	Severe	Silver maple-------- Red maple----------- White ash----------- Quaking aspen-------	70 --- --- ---	
RaA----------------- Radford	4w	Severe	Moderate	Severe	Severe	Red maple----------- Silver maple-------- White ash----------- Swamp white oak-----	45 --- --- ---	White ash, white spruce, silver maple.
RtB, RtC2---------- Rotamer	2o	Slight	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
RtD2---------------- Rotamer	2r	Moderate	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
RtE2---------------- Rotamer	2r	Severe	Slight	Slight	Moderate	Northern red oak---- White ash-----------	62 ---	Eastern white pine, red pine.
SbA, SbB----------- St. Charles	2o	Slight	Slight	Slight	Moderate	Northern red oak---- American basswood--- Red maple----------- Sugar maple---------	64 --- --- ---	Red pine, eastern white pine, white spruce, black spruce.
SfB----------------- St. Charles	2o	Slight	Slight	Slight	Moderate	Northern red oak---- American basswood--- Sugar maple--------- Red maple-----------	64 --- --- ---	Red pine, eastern white pine, white spruce.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Important trees	Site index	
ShB Salter	1o	Slight	Slight	Slight	Moderate	Northern red oak Sugar maple American basswood Red maple White ash	72 --- --- --- ---	Red pine, eastern white pine, white spruce.
SkB, SlC2 Saylesville	2c	Slight	Slight	Slight	Moderate	Northern red oak Sugar maple American basswood	65 --- ---	Eastern white pine, red pine, white spruce.
Sm Sebewa	4w	Severe	Severe	Severe	Severe	Red maple White ash Silver maple	85 --- ---	White spruce, eastern white pine, white ash, red maple.
Sn Sebewa	4w	Severe	Moderate	Moderate	Severe	Silver maple White ash	70 ---	Eastern white pine, white ash, white spruce.
SoB, SoC2 Sisson	1o	Slight	Slight	Slight	Moderate	Northern red oak White ash American basswood White oak Sugar maple	70+ --- --- --- ---	Eastern white pine, white spruce, red pine.
ThB, ThC2 Theresa	1o	Slight	Slight	Slight	Moderate	Northern red oak Sugar maple American basswood	72 --- ---	Red pine, eastern white pine, white spruce.
TuA, TuB Tuscola	1o	Slight	Slight	Slight	Severe	Northern red oak White ash American basswood White oak Sugar maple	70 --- --- --- ---	Eastern white pine, red pine, white spruce.
VrB, VwA Virgil	3o	Slight	Slight	Slight	Moderate	Northern red oak White oak Bur oak White ash	60 --- --- ---	Eastern white pine, red pine, white spruce.
WmA Wasepi	3o	Slight	Slight	Slight	Moderate	White ash American basswood Quaking aspen Northern red oak White oak Silver maple	60 --- --- --- --- ---	White spruce, eastern white pine, red pine.
WtA Watseka Variant	3s	Slight	Moderate	Slight	Moderate	Northern red oak	55	Eastern white pine, red pine, jack pine.
WvA, WvB Wauconda	---	--------	--------	--------	--------	-------------------	---	Black walnut, eastern cottonwood, green ash, bur oak, Scotch pine, eastern white pine.
WxB, WxC2 Whalan	2o	Slight	Slight	Slight	Severe	Northern red oak White oak White ash	60 --- 	Eastern white pine, red pine.
WyA Whalan Variant	2o	Slight	Slight	Slight	Moderate	Northern red oak White oak White ash	65 --- ---	Red pine, eastern white pine, white spruce.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Important trees	Site index	
YaA----------------- Yahara	1o	Slight	Slight	Slight	Moderate	Red maple------------ Sugar maple---------- Northern red oak----- American basswood---- American beech-------	70+ --- --- --- ---	Eastern white pine, white spruce, silver maple, white ash.

* See map unit description for the composition and behavior of the map unit.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; the symbol > means greater than. Absence of an entry means soil does not normally grow trees of this height class]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Ad: Adrian	---	Silky dogwood	Laurel willow	Eastern white pine	Norway poplar.
AzA: Aztalan	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, silver maple, red pine.	---
BaA: Barry	---	Silky dogwood, white spruce, Siberian crabapple, Amur privet.	Green ash, Norway spruce, northern white-cedar.	Eastern white pine, red pine.	Carolina poplar.
BoC, BpB: Boyer	Silky dogwood	Autumn-olive, Vanhoutte spirea, Amur privet.	---	Eastern white pine, jack pine, red pine.	---
CaB2, CaC2: Casco	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	---	Eastern white pine, red pine.	---
CrD2*, CrE*:					
Casco	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	---	Eastern white pine, red pine.	---
Rodman	Gray dogwood	Late lilac, common ninebark.	Eastern redcedar	Eastern white pine, red pine.	---
CtB, CtC: Chelsea	Siberian peashrub, gray dogwood.	Eastern redcedar	---	Eastern white pine, red pine.	---
DcA. Del Rey					
DdB: Dodge	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce	Eastern white pine, red pine.	---
Ed: Edwards	---	Amur privet, silky dogwood, nannyberry viburnum.	Nannyberry viburnum.	---	Carolina poplar, Norway poplar.
Ev. Elvers					
Fn*. Fluvaquents.					
FoC2, FsA, FsB: Fox	Gray dogwood	Autumn-olive, late lilac, American cranberrybush, northern white-cedar, silky dogwood.	Norway spruce, white spruce.	Eastern white pine, red pine.	---
Gd: Gilford	---	Autumn-olive, lilac.	Norway spruce, white spruce.	Eastern white pine, red pine.	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
GsB: Grays	---	Autumn-olive, lilac.	Norway spruce, white spruce.	Eastern white pine, red pine.	---
GtB: Grellton	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
GwB, GwC2: Griswold	---	Autumn-olive, lilac.	Norway spruce, white spruce.	Eastern white pine, red pine.	---
HeB: Hebron	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
Ht: Houghton	---	Silky dogwood	---	---	Norway poplar.
JuB: Juneau	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
Kb: Keowns	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, silver maple.	---
KdA: Kibbie	---	Silky dogwood, American cranberry.	White spruce	Eastern white pine, red pine.	---
KeB, KeC2, KfB, KfC2, KfD2, KgB: Kidder	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
LaB: Lamartine	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
LyB. Lorenzo					
MgA, MgB. Martinton					
MmA: Matherton	---	Silky dogwood, northern white-cedar.	White spruce	Eastern white pine	Norway poplar.
MnA: Matherton	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, silver pine.	---
MoB: Mayville	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
MpB, MpC2: McHenry	Gray dogwood	Silky dogwood	White spruce	Eastern white pine, red pine.	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mr. Milford	Gray dogwood	Silky dogwood, forsythia, redosier dogwood, northern white-cedar.	White spruce	Eastern white pine	Norway poplar.
MvB. Moundville	Manyflower cotoneaster.	Lilac, Siberian peashrub.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Ot. Otter	---	Redosier dogwood, northern white-cedar, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	Norway poplar.
Pa, Pb. Palms	---	Silky dogwood	---	---	Norway poplar.
Pg*. Pits					
RaA. Radford					
RnB. Ringwood	---	Lilac, autumn-olive.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
RtB, RtC2, RtD2, RtE2. Rotamer	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
SbA, SbB. St. Charles	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
SfB. St. Charles	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
ShB. Salter	---	Northern white-cedar, common ninebark, silky dogwood, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
SkB, SlC2. Saylesville	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
Sm. Sebewa	Silky dogwood	White spruce, northern white-cedar, redosier dogwood.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
Sn. Sebewa	Silky dogwood	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
SoB, SoC2. Sisson	Gray dogwood	Common ninebark, silky dogwood.	White spruce	Eastern white pine, red pine.	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
ThB, ThC2: Theresa	Gray dogwood	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
TuA, TuB: Tuscola	Silky dogwood	Autumn-olive, Amur privet, Vanhoutte spirea, late lilac, Tatarian honeysuckle.	White spruce, Siberian crabapple.	Eastern white pine, red pine.	---
Ud*. Udorthents					
VrB. Virgil					
VwA: Virgil	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
Wa. Wacousta					
WmA: Wasepi	---	Silky dogwood, northern white-cedar.	White spruce	Red pine, eastern white pine.	Norway poplar, green ash.
WtA: Watseka Variant	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
WvA, WvB. Wauconda					
WxB, WxC2: Whalan	---	Siberian crabapple, gray dogwood, lilac.	White spruce	Eastern white pine, red pine.	---
WyA: Whalan Variant	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, red pine.	---
YaA: Yahara	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---

* See map unit description for the composition and behavior of the map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ad------------------ Adrian	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: excess humus, floods, wetness.
AzA----------------- Aztalan	Severe: wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: frost action, low strength, wetness.	Moderate: wetness.
BaA----------------- Barry	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action.	Severe: wetness.
BoC----------------- Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
BpB----------------- Boyer	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
CaB2---------------- Casco	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Moderate: frost action.	Slight.
CaC2---------------- Casco	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
CrD2*, CrE*:						
Casco-------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rodman------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
CtB----------------- Chelsea	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: too sandy.
CtC----------------- Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
DcA----------------- Del Rey	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, low strength, wetness.	Moderate: wetness.
DdB----------------- Dodge	Slight----------	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: low strength, frost action.	Slight.
Ed------------------ Edwards	Severe: floods, wetness.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: excess humus, wetness, floods.
Ev------------------ Elvers	Severe: wetness, floods, excess humus.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, frost action.	Severe: floods, wetness.
Fn*. Fluvaquents						

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
FoC2: Fox	Severe: cutbanks cave.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: slope.
FsA: Fox	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.	Slight.
FsB: Fox	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.	Slight.
Gd: Gilford	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, floods.	Severe: wetness, floods.
GsB: Grays	Moderate: wetness.	Moderate: shrink-swell, low strength.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: frost action, low strength.	Slight.
GtB: Grellton	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.	Slight.
GwB: Griswold	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.	Slight.
GwC2: Griswold	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength, frost action.	Moderate: slope.
HeB: Hebron	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.	Slight.
Ht: Houghton	Severe: wetness, floods, excess humus.	Severe: wetness, floods, low strength.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: excess humus, wetness, floods.
JuB: Juneau	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action, low strength.	Moderate: floods.
Kb: Keowns	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
KdA: Kibbie	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, low strength.	Moderate: wetness.
KeB: Kidder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
KeC2: Kidder	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KfB: Kidder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
KfC2: Kidder	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
KfD2: Kidder	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KgB: Kidder	Slight	Moderate: shrink-swell.	Moderate: wetness.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
LaB: Lamartine	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, low strength.	Moderate: wetness, floods.
LyB: Lorenzo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
MgA, MgB: Martinton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
MmA: Matherton	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
MnA: Matherton	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: low strength, wetness, floods.	Moderate: wetness, floods.
MoB: Mayville	Moderate: wetness.	Moderate: low strength, shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
MpB: McHenry	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell.	Moderate: slope, shrink-swell, low strength.	Moderate: low strength, frost action.	Slight.
MpC2: McHenry	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Mr: Milford	Severe: wetness, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: low strength, wetness, floods.	Severe: wetness.
MvB: Moundville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: too sandy.
Ot: Otter	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, low strength.	Severe: wetness, floods.
Pa, Pb: Palms	Severe: wetness, excess humus, floods.	Severe: wetness, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, excess humus.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Pg*. Pits						
RaA Radford	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action, low strength.	Severe: floods.
RnB Ringwood	Slight	Moderate: low strength.	Slight	Moderate: slope, low strength.	Severe: low strength.	Slight.
RtB Rotamer	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
RtC2 Rotamer	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
RtD2, RtE2 Rotamer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SbA St. Charles	Moderate: wetness.	Moderate: shrink-swell, low strength.	Severe: wetness.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
SbB St. Charles	Moderate: wetness.	Moderate: shrink-swell, low strength.	Moderate: wetness.	Moderate: slope, shrink-swell, low strength.	Severe: frost action, low strength.	Slight.
SfB St. Charles	Moderate: wetness.	Moderate: shrink-swell, low strength.	Moderate: wetness, shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: low strength, frost action.	Slight.
ShB Salter	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.	Moderate: too sandy.
SkB Saylesville	Moderate: wetness.	Moderate: low strength, shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: low strength, shrink-swell, slope.	Severe: frost action, low strength.	Slight.
SlC2 Saylesville	Moderate: wetness, slope.	Moderate: low strength, shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Sm Sebewa	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action.	Severe: wetness, floods.
Sn Sebewa	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness, low strength.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.
SoB Sisson	Severe: cutbanks cave.	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Severe: low strength.	Slight.
SoC2 Sisson	Severe: cutbanks cave.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Severe: low strength.	Moderate: slope.
ThB Theresa	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ThC2: Theresa	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: slope.
TuA: Tuscola	Severe: cutbanks cave.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: wetness, low strength.	Severe: frost action.	Slight.
TuB: Tuscola	Severe: cutbanks cave.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: slope, wetness, low strength.	Severe: frost action.	Slight.
Ud*. Udorthents						
VrB: Virgil	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
VwA: Virgil	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: low strength, floods, frost action.	Severe: floods.
Wa: Wacousta	Severe: wetness, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
WmA: Wasepi	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: frost action, wetness.	Moderate: wetness.
WtA: Watseka Variant	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, too sandy.
WvA, WvB: Wauconda	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
WxB: Whalan	Moderate: depth to rock.	Severe: shrink-swell, low strength.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.	Moderate: thin layer.
WxC2: Whalan	Moderate: depth to rock, slope.	Severe: shrink-swell, low strength.	Severe: depth to rock, slope, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
WyA: Whalan Variant	Severe: depth to rock, wetness.	Severe: wetness, floods.	Severe: floods, wetness, depth to rock.	Severe: floods, wetness.	Severe: frost action, low strength.	Moderate: wetness, thin layer.
YaA: Yahara	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: frost action.	Moderate: wetness.

* See map unit description for the composition and behavior of the map unit.

TABLE 9.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad: Adrian	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: hard to pack, wetness.
AzA: Aztalan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
BaA: Barry	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
BoC: Boyer	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Fair: slope, small stones.
BpB: Boyer	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: small stones.
CaB2: Casco	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
CaC2: Casco	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
CrD2*:					
Casco	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Rodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope, small stones.
CrE*:					
Casco	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope, seepage.	Poor: slope.
Rodman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope, small stones.
CtB: Chelsea	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
CtC: Chelsea	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
DcA: Del Rey	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
DdB: Dodge	Slight	Moderate: slope, seepage.	Slight	Slight	Fair: small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ed: Edwards	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness, hard to pack.
Ev: Elvers	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Fn*. Fluvaquents					
FoC2: Fox	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
FsA, FsB: Fox	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Gd: Gilford	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Poor: wetness.
GsB: Grays	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage.	Good.
GtB: Grellton	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
GwB: Griswold	Slight	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
GwC2: Griswold	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope, small stones.
HeB: Hebron	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ht: Houghton	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: hard to pack, wetness.
JuB: Juneau	Severe: floods.	Moderate: seepage, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Kb: Keowns	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, seepage.	Poor: wetness.
KdA: Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Good.
KeB: Kidder	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
KeC2: Kidder	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
KfB: Kidder	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KfC2: Kidder	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
KfD2: Kidder	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
KgB: Kidder	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: small stones.
LaB: Lamartine	Severe: wetness, floods.	Severe: wetness, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Fair: small stones.
LyB: Lorenzo	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones.
MgA: Martinton	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Fair: too clayey.
MgB: Martinton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
MmA: Matherton	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: thin layer.
MnA: Matherton	Severe: wetness, floods, percs slowly.	Severe: wetness, seepage, floods.	Severe: wetness, floods.	Severe: wetness, floods, seepage.	Fair: too clayey.
MoB: Mayville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: small stones.
MpB: McHenry	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
MpC2: McHenry	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
Mr: Milford	Severe: wetness, percs slowly, floods.	Severe: floods, wetness.	Severe: wetness, floods, too clayey.	Severe: wetness, floods.	Poor: wetness, too clayey.
MvB: Moundville	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Fair: too sandy.
Ot: Otter	Severe: wetness, floods.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Pa, Pb: Palms	Severe: wetness, floods, subsides.	Severe: wetness, excess humus, seepage.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, seepage.	Poor: excess humus, wetness.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pg*. Pits					
RaA----------------- Radford	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Fair: too clayey.
RnB----------------- Ringwood	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
RtB----------------- Rotamer	Slight-----------	Severe: seepage, slope.	Severe: seepage.	Severe seepage.	Fair: small stones.
RtC2---------------- Rotamer	Moderate: slope.	Severe: slope,	Severe: seepage.	Severe: slope, seepage.	Fair: slope, small stones.
RtD2---------------- Rotamer	Severe: slope.	Severe: slope.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
RtE2---------------- Rotamer	Severe: slope.	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
SbA, SbB------------ St. Charles	Severe: wetness.	Moderate: wetness, seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
SfB----------------- St. Charles	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey.
ShB----------------- Salter	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----------	Slight-----------	Good.
SkB----------------- Saylesville	Severe: percs slowly, wetness.	Moderate: slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
SlC2---------------- Saylesville	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope.
Sm------------------ Sebewa	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness, small stones.
Sn------------------ Sebewa	Severe: wetness, floods, percs slowly.	Severe: wetness, seepage, floods.	Severe: wetness, floods.	Severe: wetness, floods, seepage.	Poor: wetness.
SoB----------------- Sisson	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
SoC2---------------- Sisson	Moderate: slope.	Severe: slope.	Slight-----------	Moderate: slope.	Fair: slope.
ThB----------------- Theresa	Slight-----------	Moderate: slope, seepage.	Slight-----------	Slight-----------	Fair: small stones.
ThC2---------------- Theresa	Moderate: slope.	Severe: slope.	Slight-----------	Moderate: slope.	Fair: slope, small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TuA, TuB------------ Tuscola	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Good.
Ud*. Udorthents					
VrB----------------- Virgil	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
VwA----------------- Virgil	Severe: percs slowly, wetness, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Fair: too clayey.
Wa------------------ Wacousta	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
WmA----------------- Wasepi	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Fair: thin layer.
WtA----------------- Watseka Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: too sandy.
WvA, WvB------------ Wauconda	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey.
WxB----------------- Whalan	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
WxC2---------------- Whalan	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Poor: area reclaim.
WyA----------------- Whalan Variant	Severe: wetness, percs slowly, depth to rock.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: area reclaim.
YaA----------------- Yahara	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, floods.	Good.

* See map unit description for the composition and behavior of the map unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad----------------- Adrian	Poor: excess humus, wetness.	Unsuited: excess humus.	Unsuited: excess fines, excess humus.	Poor: wetness, excess humus.
AzA----------------- Aztalan	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
BaA----------------- Barry	Poor: wetness.	Poor: excess fines.	Unsuited: excess fines.	Poor: wetness.
BoC----------------- Boyer	Good-----------------	Good-----------------	Good-----------------	Fair: too sandy, slope.
BpB----------------- Boyer	Good-----------------	Good-----------------	Good-----------------	Good.
CaB2----------------- Casco	Good-----------------	Good-----------------	Good-----------------	Fair: thin layer.
CaC2----------------- Casco	Good-----------------	Good-----------------	Good-----------------	Fair: thin layer, slope.
CrD2*:				
Casco-----------------	Fair: slope.	Good-----------------	Good-----------------	Poor: slope.
Rodman---------------	Fair: slope.	Good-----------------	Good-----------------	Poor: small stones, slope.
CrE*:				
Casco-----------------	Poor: slope.	Good-----------------	Good-----------------	Poor: slope.
Rodman---------------	Poor: slope.	Good-----------------	Good-----------------	Poor: small stones, slope.
CtB, CtC-------------- Chelsea	Good-----------------	Good-----------------	Unsuited: excess fines.	Poor: too sandy.
DcA----------------- Del Rey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
DdB----------------- Dodge	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ed----------------- Edwards	Poor: low strength, wetness.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.
Ev----------------- Elvers	Poor: wetness.	Unsuited: excess fines, excess humus.	Unsuited: excess fines, excess humus.	Poor: wetness.
Fn*. Fluvaquents				
FoC2----------------- Fox	Good-----------------	Good-----------------	Good-----------------	Fair: thin layer, slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FsA, FsB------------- Fox	Good	Good	Good	Fair: thin layer.
Gd------------------- Gilford	Poor: wetness.	Good	Unsuited: excess fines.	Poor: wetness.
GsB------------------ Grays	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
GtB------------------ Grellton	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Slight.
GwB------------------ Griswold	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
GwC2----------------- Griswold	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope.
HeB------------------ Hebron	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ht------------------- Houghton	Poor: wetness, low strength.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.
JuB------------------ Juneau	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Kb------------------- Keowns	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
KdA------------------ Kibbie	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
KeB------------------ Kidder	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
KeC2----------------- Kidder	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
KfB------------------ Kidder	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
KfC2----------------- Kidder	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
KfD2----------------- Kidder	Fair: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
KgB------------------ Kidder	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
LaB------------------ Lamartine	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
LyB------------------ Lorenzo	Good	Fair: excess fines.	Fair: excess fines.	Fair: thin layer, area reclaim.
MgA, MgB------------- Martinton	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MmA------------------- Matherton	Poor: frost action.	Good-----------------	Good-----------------	Fair: thin layer.
MnA------------------- Matherton	Poor: low strength.	Poor: thin layer.	Poor: thin layer.	Fair: thin layer.
MoB------------------- Mayville	Good-----------------	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MpB------------------- McHenry	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MpC2------------------ McHenry	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Mr-------------------- Milford	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
MvB------------------- Moundville	Good-----------------	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
Ot-------------------- Otter	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Pa, Pb---------------- Palms	Poor: wetness, low strength.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.
Pg*. Pits				
RaA------------------- Radford	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
RnB------------------- Ringwood	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
RtB------------------- Rotamer	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
RtC2------------------ Rotamer	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
RtD2------------------ Rotamer	Fair: slope, low strength.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
RtE2------------------ Rotamer	Poor: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
SbA, SbB-------------- St. Charles	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
SfB------------------- St. Charles	Poor: low strength.	Unsuited: excess fines.	Fair: excess fines.	Fair: too clayey.
ShB------------------- Salter	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too sandy.
SkB------------------- Saylesville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SlC2: Saylesville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
Sm: Sebewa	Poor: wetness.	Good	Good	Poor: wetness.
Sn: Sebewa	Poor: wetness.	Poor: thin layer.	Poor: thin layer.	Poor: wetness.
SoB: Sisson	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
SoC2: Sisson	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
ThB: Theresa	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
ThC2: Theresa	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
TuA, TuB: Tuscola	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ud*. Udorthents				
VrB: Virgil	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
VwA: Virgil	Poor: low strength.	Unsuited: excess fines.	Fair: excess fines.	Fair: thin layer.
Wa: Wacousta	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
WmA: Wasepi	Fair: wetness.	Good	Good	Fair: thin layer.
WtA: Watseka Variant	Fair: wetness.	Good	Unsuited: excess fines.	Poor: too sandy.
WvA, WvB: Wauconda	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
WxB: Whalan	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
WxC2: Whalan	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, area reclaim.
WyA: Whalan Variant	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
YaA: Yahara	Fair: wetness, low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.

* See map unit description for the composition and behavior of the map unit.

TABLE 11.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Ad: Adrian	Seepage	Seepage, wetness.	Favorable	Floods, frost action.	Not needed	Wetness.
AzA: Aztalan	Favorable	Wetness	Slow refill	Frost action	Not needed	Wetness.
BaA: Barry	Seepage	Wetness	Favorable	Frost action	Not needed	Wetness.
BoC: Boyer	Seepage	Seepage	No water	Not needed	Complex slope, soil blowing, too sandy.	Slope, droughty.
BpB: Boyer	Seepage	Seepage	No water	Not needed	Complex slope, soil blowing, too sandy.	Droughty.
CaB2: Casco	Seepage	Seepage	No water	Not needed	Too sandy	Droughty.
CaC2: Casco	Seepage	Seepage	No water	Not needed	Too sandy	Droughty, slope.
CrD2*, CrE*:						
Casco	Seepage	Seepage	No water	Not needed	Slope, too sandy.	Droughty, slope.
Rodman	Seepage	Seepage	No water	Not needed	Slope, too sandy.	Slope, droughty.
CtB: Chelsea	Seepage	Piping, seepage.	No water	Not needed	Complex slope, too sandy, soil blowing.	Droughty.
CtC: Chelsea	Seepage	Piping, seepage.	No water	Not needed	Complex slope, too sandy, soil blowing.	Slope, droughty.
DcA: Del Rey	Favorable	Hard to pack, wetness.	Slow refill	Percs slowly, frost action.	Not needed	Wetness, erodes easily, percs slowly.
DdB: Dodge	Seepage	Piping	No water	Not needed	Favorable	Erodes easily.
Ed: Edwards	Seepage	Excess humus, wetness.	Slow refill	Frost action, poor outlets, floods.	Not needed	Wetness.
Ev: Elvers	Seepage	Seepage, excess humus.	Slow refill	Floods, frost action.	Not needed	Wetness, erodes easily.
Fn*. Fluvaquents						
FoC2: Fox	Seepage	Seepage	No water	Not needed	Too sandy	Slope.
FsA: Fox	Seepage	Seepage	No water	Not needed	Not needed	Favorable.
FsB: Fox	Seepage	Seepage	No water	Not needed	Too sandy	Favorable.
Gd: Gilford	Seepage	Seepage	Favorable	Floods, frost action.	Not needed	Wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
GsB: Grays	Seepage	Piping	Deep to water, slow refill.	Not needed	Erodes easily	Erodes easily.
GtB: Grellton	Seepage	Favorable	No water	Not needed	Slope, soil blowing.	Favorable.
GwB: Griswold	Seepage	Favorable	No water	Not needed	Soil blowing	Favorable.
GwC2: Griswold	Seepage	Favorable	No water	Not needed	Soil blowing	Slope.
HeB: Hebron	Favorable	Favorable	No water	Not needed	Erodes easily	Erodes easily.
Ht: Houghton	Seepage	Excess humus, low strength.	Favorable	Poor outlets, frost action.	Not needed	Wetness.
JuB: Juneau	Seepage	Favorable	Deep to water	Not needed	Favorable	Erodes easily.
Kb: Keowns	Seepage	Wetness, piping.	Slow refill	Floods, frost action.	Not needed	Wetness.
KdA: Kibbie	Seepage	Piping, wetness.	Slow refill	Frost action	Not needed	Wetness, erodes easily.
KeB: Kidder	Seepage	Favorable	No water	Not needed	Complex slope, soil blowing.	Favorable.
KeC2: Kidder	Seepage	Favorable	No water	Not needed	Complex slope, soil blowing.	Slope.
KfB: Kidder	Seepage	Favorable	No water	Not needed	Complex slope	Favorable.
KfC2: Kidder	Seepage	Favorable	No water	Not needed	Complex slope	Slope.
KfD2: Kidder	Slope, seepage.	Favorable	No water	Not needed	Slope	Slope.
KgB: Kidder	Seepage	Wetness	Deep to water	Not needed	Complex slope	Favorable.
LaB: Lamartine	Seepage	Piping, wetness.	Deep to water, slow refill.	Frost action, floods.	Wetness, erodes easily.	Wetness, erodes easily.
LyB: Lorenzo	Seepage	Seepage	No water	Not needed	Too sandy, soil blowing.	Droughty.
MgA: Martinton	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Not needed	Wetness, erodes easily, percs slowly.
MgB: Martinton	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Wetness, erodes easily, percs slowly.	Wetness, erodes easily, percs slowly.
MmA: Matherton	Seepage	Seepage, wetness.	Favorable	Frost action	Not needed	Favorable.
MnA: Matherton	Seepage	Wetness	Slow refill	Frost action, floods.	Not needed	Wetness.
MoB: Mayville	Seepage	Piping	Deep to water, slow refill.	Not needed	Favorable	Erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
MpB------ McHenry	Seepage------	Favorable------	No water------	Not needed-----	Favorable------	Erodes easily.
MpC2------ McHenry	Seepage------	Favorable------	No water------	Not needed-----	Favorable------	Erodes easily, slope.
Mr------ Milford	Favorable------	Wetness------	Slow refill----	Floods, frost action.	Not needed-----	Wetness.
MvB------ Moundville	Seepage------	Seepage, piping.	Deep to water	Not needed-----	Soil blowing, too sandy, wetness.	Droughty.
Ot------ Otter	Seepage------	Piping, wetness.	Slow refill----	Floods, frost action.	Not needed-----	Wetness.
Pa, Pb------ Palms	Seepage------	Excess humus, wetness.	Favorable------	Floods, frost action.	Not needed-----	Wetness.
Pg*. Pits						
RaA------ Radford	Seepage------	Wetness------	Deep to water, slow refill.	Floods, frost action.	Not needed-----	Wetness.
RnB------ Ringwood	Seepage------	Seepage------	Deep to water, slow refill.	Not needed-----	Erodes easily	Erodes easily.
RtB------ Rotamer	Seepage------	Seepage------	No water------	Not needed-----	Favorable------	Favorable.
RtC2------ Rotamer	Seepage------	Seepage------	No water------	Not needed-----	Favorable------	Slope.
RtD2, RtE2------ Rotamer	Seepage, slope.	Seepage------	No water------	Not needed-----	Slope------	Slope.
SbA------ St. Charles	Seepage------	Favorable------	Deep to water, slow refill.	Not needed-----	Not needed-----	Erodes easily.
SbB------ St. Charles	Seepage------	Favorable------	Deep to water, slow refill.	Not needed-----	Slope------	Erodes easily.
SfB------ St. Charles	Seepage------	Wetness------	Deep to water, slow refill.	Frost action---	Wetness, too sandy.	Erodes easily.
ShB------ Salter	Seepage------	Piping------	No water------	Not needed-----	Erodes easily, too sandy.	Erodes easily.
SkB------ Saylesville	Favorable------	Favorable------	Deep to water, slow refill.	Not needed-----	Favorable------	Erodes easily.
SlC2------ Saylesville	Favorable------	Favorable------	Deep to water, slow refill.	Not needed-----	Favorable------	Erodes easily, slope.
Sm------ Sebewa	Seepage------	Seepage, wetness.	Slow refill----	Frost action---	Not needed-----	Wetness.
Sn------ Sebewa	Seepage------	Wetness------	Slow refill----	Frost action, floods.	Not needed-----	Wetness.
SoB------ Sisson	Seepage------	Favorable------	No water------	Not needed-----	Soil blowing---	Favorable.
SoC2------ Sisson	Seepage------	Favorable------	No water------	Not needed-----	Soil blowing---	Slope.
ThB------ Theresa	Seepage------	Piping------	No water------	Not needed-----	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
ThC2 Theresa	Seepage	Piping	No water	Not needed	Erodes easily	Slope, erodes easily.
TuA Tuscola	Seepage	Wetness	Deep to water, slow refill.	Frost action	Not needed	Favorable.
TuB Tuscola	Seepage	Wetness	Deep to water, slow refill.	Frost action	Wetness	Favorable.
Ud*. Udorthents						
VrB Virgil	Seepage	Wetness	Slow refill	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
VwA Virgil	Seepage	Wetness	Slow refill	Frost action, floods.	Not needed	Wetness, erodes easily.
Wa Wacousta	Seepage	Wetness	Slow refill	Floods, frost action.	Not needed	Wetness, erodes easily.
WmA Wasepi	Seepage	Seepage, wetness.	Favorable	Frost action	Not needed	Wetness.
WtA Watseka Variant	Seepage	Wetness, seepage.	Deep to water	Favorable	Not needed	Wetness, droughty.
WvA Wauconda	Seepage	Piping, wetness.	Slow refill	Frost action	Not needed	Wetness, erodes easily.
WvB Wauconda	Seepage	Piping, wetness.	Slow refill	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
WxB Whalan	Depth to rock	Thin layer, hard to pack.	No water	Not needed	Depth to rock	Depth to rock.
WxC2 Whalan	Depth to rock	Thin layer, hard to pack.	No water	Not needed	Depth to rock	Depth to rock, slope.
WyA Whalan Variant	Depth to rock	Thin layer, wetness.	Slow refill	Depth to rock, frost action.	Not needed	Wetness, erodes easily, depth to rock.
YaA Yahara	Seepage	Piping, wetness.	Slow refill	Frost action	Wetness, soil blowing.	Wetness, erodes easily.

* See map unit description for the composition and behavior of the map unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ad------------------- Adrian	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus, floods.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, floods.
AzA------------------ Aztalan	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BaA------------------ Barry	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BoC------------------ Boyer	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy, slope.
BpB------------------ Boyer	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
CaB2----------------- Casco	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
CaC2----------------- Casco	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
CrD2*:					
Casco----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Rodman---------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope, small stones.
CrE*:					
Casco----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rodman---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
CtB------------------ Chelsea	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: too sandy.
CtC------------------ Chelsea	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy, slope.
DcA------------------ Del Rey	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
DdB------------------ Dodge	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
Ed------------------- Edwards	Severe: floods, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ev: Elvers	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: floods, wetness.
Fn*. Fluvaquents					
FoC2: Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FsA: Fox	Slight	Slight	Slight	Slight	Slight.
FsB: Fox	Slight	Slight	Moderate: slope.	Slight	Slight.
Gd: Gilford	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
GsB: Grays	Slight	Slight	Moderate: slope.	Slight	Slight.
GtB: Grellton	Slight	Slight	Moderate: slope.	Slight	Slight.
GwB: Griswold	Slight	Slight	Moderate: slope.	Slight	Slight.
GwC2: Griswold	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
HeB: Hebron	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
Ht: Houghton	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.
JuB: Juneau	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.
Kb: Keowns	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
KdA: Kibbie	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
KeB: Kidder	Slight	Slight	Moderate: slope.	Slight	Slight.
KeC2: Kidder	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
KfB: Kidder	Slight	Slight	Moderate: slope.	Slight	Slight.
KfC2: Kidder	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
KfD2: Kidder	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
KgB: Kidder	Slight	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LaB: Lamartine	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
LyB: Lorenzo	Slight	Slight	Moderate: slope.	Slight	Slight.
MgA, MgB: Martinton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: floods, wetness.
MmA: Matherton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MnA: Matherton	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
MoB: Mayville	Slight	Slight	Moderate: slope.	Slight	Slight.
MpB: McHenry	Slight	Slight	Moderate: slope.	Slight	Slight.
MpC2: McHenry	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Mr: Milford	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MvB: Moundville	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.
Ot: Otter	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Pa, Pb: Palms	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.
Pg*. Pits					
RaA: Radford	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness, floods.	Moderate: wetness.	Severe: floods.
RnB: Ringwood	Slight	Slight	Moderate: slope.	Slight	Slight.
RtB: Rotamer	Slight	Slight	Moderate: slope.	Slight	Slight.
RtC2: Rotamer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
RtD2: Rotamer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
RtE2: Rotamer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SbA: St. Charles	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SbB, SfB: St. Charles	Slight	Slight	Moderate: slope.	Slight	Slight.
ShB: Salter	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: too sandy.
SkB: Saylesville	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
SlC2: Saylesville	Moderate: slope, percs slowly, too clayey.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
Sm: Sebewa	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
Sn: Sebewa	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
SoB: Sisson	Slight	Slight	Moderate: slope.	Slight	Slight.
SoC2: Sisson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
ThB: Theresa	Slight	Slight	Moderate: slope.	Slight	Slight.
ThC2: Theresa	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
TuA: Tuscola	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
TuB: Tuscola	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
Ud*. Udorthents					
VrB: Virgil	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: floods.
VwA: Virgil	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
Wa: Wacousta	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey.	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey.	Severe: wetness, floods.
WmA: Wasepi	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
WtA: Watseka Variant	Severe: wetness.	Moderate: wetness, too sandy.	Severe: wetness.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
WvA, WvB: Wauconda	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WxB------------------- Whalan	Moderate: percs slowly.	Slight-----------	Moderate: depth to rock, slope, percs slowly.	Slight-------------	Moderate: thin layer.
WxC2------------------ Whalan	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight-------------	Moderate: slope, thin layer.
WyA------------------- Whalan Variant	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer.
YaA------------------- Yahara	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* See map unit description for the composition and behavior of the map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Ad----------------- Adrian	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
AzA---------------- Aztalan	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
BaA---------------- Barry	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
BoC---------------- Boyer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BpB---------------- Boyer	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaB2, CaC2--------- Casco	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CrD2*:										
Casco-------------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Rodman------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CrE*:										
Casco-------------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rodman------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CtB---------------- Chelsea	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CtC---------------- Chelsea	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
DcA---------------- Del Rey	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
DdB---------------- Dodge	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ed----------------- Edwards	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ev----------------- Elvers	Good	Fair	Good	Good	Good	Good	Good	Good	Good	Good.
Fn*. Fluvaquents										
FoC2--------------- Fox	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FsA, FsB----------- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gd----------------- Gilford	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
GsB---------------- Grays	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
GtB: Grellton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GwB: Griswold	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GwC2: Griswold	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HeB: Hebron	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ht: Houghton	Good	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
JuB: Juneau	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Kb: Keowns	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
KdA: Kibbie	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
KeB: Kidder	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
KeC2: Kidder	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
KfB: Kidder	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
KfC2: Kidder	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
KfD2: Kidder	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
KgB: Kidder	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LaB: Lamartine	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
LyB: Lorenzo	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
MgA: Martinton	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
MgB: Martinton	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
MmA: Matherton	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
MnA: Matherton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MoB: Mayville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MpB: McHenry	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
MpC2---------------- McHenry	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mr------------------ Milford	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
MvB----------------- Moundville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ot------------------ Otter	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
Pa------------------ Palms	Good	Fair	Fair	Poor	Poor	Poor	Poor	Fair	Poor	Poor.
Pb------------------ Palms	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Pg*. Pits										
RaA----------------- Radford	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
RnB----------------- Ringwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RtB----------------- Rotamer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RtC2---------------- Rotamer	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RtD2---------------- Rotamer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RtE2---------------- Rotamer	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
SbA, SbB, SfB------ St. Charles	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ShB----------------- Salter	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SkB----------------- Saylesville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SlC2---------------- Saylesville	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sm------------------ Sebewa	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
Sn------------------ Sebewa	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
SoB----------------- Sisson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SoC2---------------- Sisson	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ThB----------------- Theresa	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
ThC2 Theresa	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
TuA, TuB Tuscola	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud*. Udorthents										
VrB Virgil	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Fair.
VwA Virgil	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
Wa Wacousta	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
WmA Wasepi	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
WtA Watseka Variant	Poor	Fair	Fair	Poor	Fair	Fair	Poor	Fair	Poor	Poor.
WvA, WvB Wauconda	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor.
WxB, WxC2 Whalan	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WyA Whalan Variant	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
YaA Yahara	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.

* See map unit description for the composition and behavior of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ad------------------ Adrian	0-34	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	34-60	Sand, loamy sand	SP, SM	A-2, A-3	0	80-100	60-100	35-75	0-30	---	NP
AzA----------------- Aztalan	0-14	Fine sandy loam	SM, ML	A-2, A-4	0	85-100	85-100	60-85	30-55	<20	1-4
	14-25	Loam, sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2	0	85-100	85-100	60-95	30-75	20-35	5-20
	25-60	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-100	35-45	15-25
BaA----------------- Barry	0-15	Silt loam--------	ML, CL, CL-ML	A-4	0-3	95-100	90-100	80-100	55-90	20-30	NP-8
	15-25	Loam, sandy clay loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0-3	95-100	90-100	80-90	45-75	18-28	4-14
	25-60	Sandy loam-------	SM	A-2, A-4	0-3	95-100	90-100	35-70	30-40	<20	NP-5
BoC----------------- Boyer	0-15	Loamy sand-------	SM, SM-SC	A-2, A-1	0-5	95-100	65-95	45-75	15-30	<20	NP-6
	15-29	Sandy loam, loam, gravelly sandy loam.	SM, SC, SM-SC, SP-SM	A-2, A-4, A-6	0-5	80-100	65-95	55-85	10-45	10-35	NP-16
	29-60	Stratified sand to gravel.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-100	30-70	0-10	---	NP
BpB----------------- Boyer	0-15	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	65-95	60-75	25-40	<25	NP-7
	15-32	Sandy loam, loam, gravelly sandy loam.	SM, SC, SM-SC, SP-SM	A-2, A-4, A-6	0-5	80-100	65-95	55-85	10-45	10-35	NP-16
	32-60	Stratified sand to gravel.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-100	30-70	0-10	---	NP
CaB2, CaC2---------- Casco	0-5	Loam-------------	ML, CL-ML, CL	A-4	0	95-100	90-100	75-100	50-75	20-30	3-10
	5-20	Clay loam, sandy loam, sandy clay loam.	SC, CL	A-6, A-7 A-2	0-5	60-100	55-100	55-90	30-70	20-45	7-25
	20-60	Sand and gravel	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-90	10-90	3-10	---	NP
CrD2*, CrE*:											
Casco--------------	0-5	Loam-------------	ML, CL-ML, CL	A-4	0	95-100	90-100	75-100	50-75	20-30	3-10
	5-20	Clay loam, sandy loam, sandy clay loam.	SC, CL	A-6, A-7	0-5	60-100	55-100	55-90	30-70	20-45	7-25
	20-60	Sand and gravel	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-90	10-90	3-10	---	NP
Rodman-------------	0-13	Gravelly sandy loam.	SM-SC, SM	A-1, A-2, A-4	0-2	70-85	65-85	40-60	20-40	<25	NP-5
	13-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CtB, CtC----------- Chelsea	0-11	Loamy fine sand	SM	A-2-4	0	100	100	65-80	10-35	---	NP
	11-60	Fine sand-------	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
DcA---------------- Del Rey	0-10	Silt loam-------	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	90-98	75-95	25-50	5-20
	10-26	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	95-100	95-100	90-100	70-95	35-55	15-30
	26-60	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	95-100	95-100	90-100	70-95	30-50	5-25
DdB---------------- Dodge	0-10	Silt loam-------	CL, CL-ML, ML	A-4	0	100	100	90-100	70-95	20-30	3-10
	10-33	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	90-100	70-95	35-55	15-25
	33-38	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0-2	90-100	85-95	75-95	45-60	30-45	15-25
	38-60	Gravelly loam, gravelly sandy loam, gravelly silt loam.	ML, CL, SM, SC	A-2, A-4	1-5	75-90	65-90	60-80	15-70	15-30	NP-10
Ed----------------- Edwards	0-21	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	21-46	Marl------------	---	---	0	100	95-100	80-90	60-80	---	---
	46-60	Sand, loamy sand	SP, SM	A-2, A-3	0	80-100	60-100	35-75	0-30	---	NP
Ev----------------- Elvers	0-22	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	22-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Fn*. Fluvaquents											
FoC2--------------- Fox	0-10	Loam------------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	10-22	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	85-100	75-100	70-95	55-90	25-45	10-25
	22-26	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0	85-100	75-95	50-95	20-65	25-45	10-25
	26-60	Sand and gravel	SP, SM, GP, GM	A-1, A-2, A-3	0-5	40-100	35-100	15-95	2-15	---	NP
FsA, FsB----------- Fox	0-10	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	10-29	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	85-100	75-100	70-95	55-90	25-45	10-25
	29-33	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0	85-100	75-95	50-95	20-65	25-45	10-25
	33-60	Sand and gravel	SP, SM, GP, GM	A-1, A-2, A-3	0-5	40-100	35-100	15-95	2-15	---	NP
Gd----------------- Gilford	0-11	Sandy loam------	SC, SM-SC	A-4, A-2-4	0	95-100	90-100	60-70	30-40	20-30	4-10
	11-29	Sandy loam, fine sandy loam.	SM, SC, SM-SC	A-2-4	0	90-100	90-100	55-70	20-35	15-30	NP-8
	29-60	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1-B, A-2-4	0	90-100	85-100	18-60	3-20	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
GsB----------------- Grays	0-18	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-95	25-40	8-20
	18-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	90-100	60-90	30-45	15-25
	38-60	Stratified silt loam to very fine sand.	ML, CL, SM, SC	A-4, A-2, A-6	0	90-100	80-100	70-100	30-70	15-40	NP-20
GtB----------------- Grellton	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	75-85	25-45	<20	NP-5
	14-35	Loam, sandy loam, sandy clay loam.	SM, ML, SC, CL	A-4, A-6	0	100	100	85-95	40-55	20-30	2-12
	35-44	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	75-90	25-40	10-20
	44-60	Silt loam, sandy loam, gravelly sandy loam.	SM, ML	A-4	1-5	75-100	70-100	60-100	35-90	<30	NP-4
GwB, GwC2---------- Griswold	0-12	Sandy loam------	SM	A-4	0	95-100	95-100	90-100	35-50	<30	NP-5
	12-25	Loam, sandy clay loam, clay loam.	CL-ML, CL, SM-SC, SC	A-6, A-4	0-5	95-100	90-100	80-90	45-80	20-35	5-15
	25-60	Sandy loam, gravelly sandy loam.	SM, SC	A-2, A-4	0-10	85-95	65-85	50-75	20-45	<25	3-10
HeB----------------- Hebron	0-12	Loam-------------	ML	A-4	0	95-100	95-100	85-100	50-70	20-30	NP-7
	12-34	Clay loam, loam, sandy clay loam	CL, SC,	A-4, A-6	0	85-100	85-100	80-95	35-90	25-40	10-20
	34-40	Silty clay loam, silty clay	CL	A-7	0	100	100	80-100	80-95	40-50	20-30
	40-60	Stratified silt and clay.	CL	A-6, A-7	0	100	100	85-100	85-100	25-50	11-30
Ht------------------ Houghton	0-72	Sapric material	Pt	---	0	---	---	---	---	---	---
JuB----------------- Juneau	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	9-27	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	3-12
	27-52	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-30
	52-60	Sandy loam, silt loam, loam.	CL, ML, SM, SC	A-6, A-4	0	100	1000	60-100	35-90	10-40	2-21
Kb------------------ Keowns	0-7	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	60-90	20-30	3-10
	7-19	Silt loam, very fine sandy loam, sandy loam.	ML, CL, SM, SC	A-4, A-2	0	100	100	60-100	30-85	<20	NP-10
	19-60	Stratified silt to very fine sand.	ML, SM	A-2, A-4	0	100	100	70-95	30-95	<20	NP-4
KdA----------------- Kibbie	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	75-95	40-60	18-25	2-7
	9-35	Clay loam, sandy clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	90-100	85-100	80-100	35-90	25-45	6-25
	35-60	Stratified silt to fine sand.	ML, SM, SC, CL	A-4, A-2	0	100	95-100	70-95	30-80	<30	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KeB, KeC2---------- Kidder	0-7	Sandy loam------	SM, ML	A-2, A-4	0-5	90-100	90-100	60-85	30-55	<20	1-4
	7-29	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-4	0-5	75-100	75-100	65-95	45-70	25-40	8-15
	29-60	Sandy loam, gravelly sandy loam.	SM, GM	A-2	3-10	50-90	50-90	50-80	15-35	---	NP
KfB, KfC2, KfD2---- Kidder	0-11	Loam------------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	60-90	20-30	3-10
	11-31	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-4	0-5	75-100	75-100	65-95	45-70	25-40	8-15
	31-60	Sandy loam, gravelly sandy loam.	SM, GM	A-2	3-10	50-90	50-90	50-80	15-35	---	NP
KgB---------------- Kidder	0-14	Loam------------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	60-90	20-30	3-10
	14-34	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-4	0-5	75-100	75-100	65-95	45-70	25-40	8-15
	34-60	Sandy loam, gravelly sandy loam.	SM, GM	A-2	3-10	50-90	50-90	50-80	15-35	---	NP
LaB---------------- Lamartine	0-11	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	11-25	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-30
	25-30	Clay loam, loam	CL	A-6	0	85-100	85-100	85-95	60-80	25-40	10-25
	30-60	Loam, sandy loam, gravelly sandy loam.	CL, ML, SM, SC	A-4	0-5	75-90	65-90	60-80	35-70	20-30	NP-10
LyB---------------- Lorenzo	0-11	Sandy loam------	SM	A-2, A-4	0-5	95-100	95-100	55-70	25-40	<20	1-4
	11-18	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-7	5-10	95-100	95-100	80-100	40-90	30-50	10-25
	18-60	Sand and gravel	GM, GC, SM, SC	A-1, A-2	5-20	25-80	25-80	10-70	5-35	<30	NP-10
MgA, MgB----------- Martinton	0-11	Silt loam-------	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	34-49	13-19
	11-30	Silty clay loam, silty clay.	CH, CL	A-7	0	95-100	95-100	90-100	70-95	41-55	15-32
	30-60	Stratified silt to clay.	CL	A-6, A-7	0	95-100	95-100	90-100	75-100	25-50	10-30
MmA---------------- Matherton	0-13	Silt loam-------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	85-95	55-90	20-30	NP-8
	13-29	Sandy clay loam, gravelly clay loam.	SC, CL	A-6, A-4	0-5	95-100	65-95	55-85	35-70	25-40	3-20
	29-60	Sand and gravel	GP, SP, SP-SM, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-90	30-55	0-10	---	NP
MnA---------------- Matherton	0-11	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-95	60-90	20-30	2-8
	11-35	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	90-100	80-100	35-75	25-40	8-20
	35-48	Sand and gravel	GP, SP, SP-SM, GP-GM	A-1, A-3	0-10	40-80	35-70	30-55	0-10	---	NP
	48-60	Silty clay, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	15-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoB----------------- Mayville	0-12	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	12-25	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	80-100	70-95	35-55	15-30
	25-38	Silty clay loam, clay loam.	CL	A-6, A-7	0-2	90-100	85-95	75-95	70-85	30-45	15-25
	38-60	Gravelly sandy loam, loam, gravelly loam.	SM, SC, ML, CL	A-2, A-4	0-5	75-90	65-90	60-80	15-70	15-30	NP-10
MpB, MpC2---------- McHenry	0-12	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	70-90	20-40	5-15
	12-36	Silty clay loam, clay loam, sandy clay loam.	CL	A-7, A-6	0	95-100	90-100	80-100	55-90	35-50	20-35
	36-60	Sandy loam, gravelly sandy loam.	SM, SC, SM-SC	A-2, A-4	0-5	85-100	65-90	55-80	20-45	<25	NP-10
Mr----------------- Milford	0-11	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	11-28	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	28-60	Stratified clay to sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30
MvB---------------- Moundville	0-10	Loamy sand------	SM	A-2, A-4	0	100	100	50-85	15-40	---	NP
	10-26	Loamy fine sand, loamy sand.	SM	A-2, A-4	0	100	100	50-85	15-40	---	NP
	26-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3, A-4	0	95-100	95-100	50-85	5-40	---	NP
Ot----------------- Otter	0-60	Silt loam-------	CL	A-6, A-7	0	100	98-100	90-100	80-100	30-45	10-20
Pa, Pb------------- Palms	0-35	Sapric material	Pt	---	---	---	---	---	---	---	---
	35-60	Clay loam, loam, silt loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
Pg*. Pits											
RaA---------------- Radford	0-22	Silt loam-------	ML, CL	A-4, A-6	0	100	100	95-100	80-100	30-40	5-15
	22-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	100	95-100	80-95	35-50	15-25
RnB---------------- Ringwood	0-14	Silt loam-------	CL	A-4, A-6	0	100	100	95-100	70-90	28-40	8-20
	14-20	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	60-95	30-55	15-35
	20-39	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	100	90-100	85-95	45-70	25-40	11-25
	39-60	Gravelly sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	85-95	60-90	50-80	30-50	<20	NP-10
RtB, RtC2, RtD2, RtE2-------------- Rotamer	0-7	Loam------------	ML	A-4	0-1	95-100	95-100	75-85	55-85	20-30	1-6
	7-13	Clay loam, sandy clay loam.	CL, SC	A-6	0-3	85-95	85-95	80-90	45-60	25-35	10-15
	13-60	Gravelly sandy loam.	SM	A-2	3-10	75-90	65-90	60-80	15-35	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
SbA, SbB----------- St. Charles	0-15	Silt loam-------	CL-ML, CL, ML	A-4, A-6	0	100	100	95-100	95-100	20-35	3-15
	15-45	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	90-100	25-40	10-25
	45-60	Stratified silt loam to sandy loam.	ML, SC, SM, CL	A-2, A-4	0-5	90-100	80-90	60-90	30-70	<25	3-10
SfB---------------- St. Charles	0-6	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	95-100	95-100	20-30	3-10
	6-44	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	90-100	29-40	12-23
	44-51	Sandy clay loam	SC	A-6	0-5	95-100	95-100	80-90	35-50	30-40	13-22
	51-60	Sand and gravel	GW-GM	A-1	5-20	30-40	20-30	10-20	5-10	---	NP
ShB---------------- Salter	0-9	Loamy sand------	SM, ML	A-2, A-4	0	100	100	50-95	20-60	---	NP
	9-21	Loamy fine sand, fine sandy loam, loam.	SM, SC, SM-SC, ML	A-2, A-4, A-6	0	100	100	50-100	20-95	10-25	1-12
	21-60	Stratified silt to very fine sand.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-100	40-100	<25	NP-5
SkB---------------- Saylesville	0-10	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	85-100	60-90	20-30	3-10
	10-41	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-65	25-40
	41-60	Stratified silt to clay.	CL	A-6, A-7	0	100	100	95-100	95-100	30-45	10-25
SlC2--------------- Saylesville	0-7	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	25-40	10-20
	7-27	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-65	25-40
	27-60	Stratified silt to clay.	CL	A-6, A-7	0	100	100	95-100	95-100	30-45	10-25
Sm----------------- Sebewa	0-11	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	95-100	80-100	80-95	60-90	22-35	6-12
	11-27	Sandy clay loam, loam, gravelly clay loam.	SC, CL	A-4, A-6	0	95-100	65-95	55-85	40-75	25-40	8-20
	27-60	Sand and gravel	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP
Sn----------------- Sebewa	0-13	Silt loam-------	ML, CL-ML, CL	A-4	0	90-100	90-100	85-100	60-90	20-30	3-10
	13-27	Sandy clay loam, loam, fine sandy loam.	CL	A-4	0	95-100	95-100	85-100	60-80	25-40	10-21
	27-42	Sand and gravel	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP
	42-60	Stratified clay to silt.	CH	A-7	0	100	100	95-100	85-100	50-60	30-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
SoB, SoC2---------- Sisson	0-8	Fine sandy loam	CL, ML, SM, SC	A-4	0	100	100	60-85	35-55	<28	NP-10
	8-20	Loam, silty clay loam, silt loam.	CL	A-4, A-6	0	100	100	85-100	60-90	18-40	7-25
	20-60	Stratified silt loam to fine sand.	CL, ML, SM, SC	A-2, A-4, A-6	0	100	95-100	65-95	25-90	<35	NP-15
ThB, ThC2---------- Theresa	0-9	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	9-18	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	18-30	Clay loam, loam	CL	A-6, A-7	0-2	80-100	80-100	70-95	60-90	35-50	15-30
	30-60	Loam, gravelly loam, gravelly sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0-10	50-95	50-90	30-80	15-75	<20	NP-6
TuA, TuB----------- Tuscola	0-10	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	85-100	60-90	20-30	3-10
	10-29	Clay loam, loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	60-90	15-40	6-20
	29-60	Stratified fine sand to silt loam.	SM, ML	A-4	0	100	95-100	75-90	40-90	<25	NP-4
Ud*. Udorthents											
VrB---------------- Virgil	0-10	Silt loam-------	CL	A-4, A-6	0	100	100	90-100	70-95	20-35	8-20
	10-41	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4 A-7	0	100	100	95-100	90-100	20-50	5-30
	41-60	Loam, sandy loam, clay loam.	CL, SC, SM-SC, CL-ML	A-2, A-4, A-6	0-5	90-100	85-100	70-100	30-90	20-35	5-15
VwA---------------- Virgil	0-11	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-95	20-30	3-10
	11-41	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4 A-7	0	100	100	95-100	90-100	20-50	5-30
	41-46	Sandy clay loam	SC	A-6	0-5	95-100	95-100	80-90	35-50	30-40	13-22
	46-60	Sand and gravel	GW-GM	A-1	0-5	30-40	20-30	10-20	5-10	---	NP
Wa----------------- Wacousta	0-19	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	40-65	20-40
	19-60	Silt loam-------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	80-90	30-40	5-20
WmA---------------- Wasepi	0-9	Sandy loam------	SM, SM-SC	A-2, A-4	0-5	85-100	70-95	60-95	25-40	<27	NP-7
	9-38	Loamy sand, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0-5	85-100	70-95	55-85	20-45	15-35	2-16
	38-60	Sand, gravel, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-10	40-80	35-70	30-60	0-10	---	NP
WtA---------------- Watseka Variant	0-18	Loamy sand------	SM	A-2	0	100	95-100	45-75	15-30	---	NP
	18-60	Fine sand, sand, loamy fine sand.	SP, SM	A-3, A-2	0	90-100	90-100	60-80	3-25	---	NP
WvA, WvB----------- Wauconda	0-13	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	20-35	6-15
	13-32	Silty clay loam	CL	A-7, A-6	0	100	95-100	90-100	85-100	30-45	15-30
	32-60	Loam, silt loam, sand.	ML, CL, SM, SC	A-2, A-4, A-6	0	100	95-100	70-100	30-90	<30	NP-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WxB, WxC2---------- Whalan	0-11	Loam------------	ML	A-4	0	100	95-100	85-95	60-90	30-40	5-10
	11-33	Clay loam, loam	CL	A-6	0	95-100	95-100	80-95	70-90	30-40	10-15
	33-36	Clay loam, clay	CL, CH, MH	A-7	0-2	90-100	80-95	80-90	60-75	40-60	20-30
	36+	Weathered bedrock.									
WyA---------------- Whalan Variant	0-9	Silt loam--------	CL, CL-ML, ML	A-4	0	100	100	90-100	70-96	20-30	3-10
	9-12	Sandy loam------	SM	A-2, A-4	0	100	100	60-70	30-40	<20	NP-4
	12-22	Clay loam, loam	CL, CL-ML	A-4, A-6	0	85-100	85-100	80-95	60-80	25-40	6-15
	22-27	Clay------------	CL, CH	A-7	0-2	85-100	85-100	80-95	70-90	40-60	20-50
	27+	Weathered bedrock.									
YaA---------------- Yahara	0-24	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	100	100	70-95	40-65	<20	NP-5
	24-60	Stratified fine sand to silt loam.	ML, SM	A-4	0	100	100	80-100	40-95	---	NP

* See map unit description for the composition and behavior of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater then. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Ad: Adrian	0-34	2.0-6.0	0.35-0.45	5.1-7.8	-----------	High	Moderate	0.10	5	3
	34-60	6.0-20	0.03-0.08	6.1-8.4	Low	High	Moderate	0.10		
AzA: Aztalan	0-14	0.6-6.0	0.13-0.18	6.6-7.8	Low	High	Low	0.32	3	3
	14-25	0.6-2.0	0.12-0.19	6.6-7.8	Low	High	Low	0.32		
	25-60	0.2-0.6	0.10-0.20	6.6-8.4	Moderate	High	Low	0.32		
BaA: Barry	0-15	0.6-2.0	0.20-0.22	6.1-7.8	Low	High	Low	0.32	5	5
	15-25	0.6-2.0	0.14-0.19	6.1-7.8	Low	High	Low	0.32		
	25-60	2.0-6.0	0.10-0.13	7.4-8.4	Low	High	Low	0.32		
BoC: Boyer	0-15	6.0-20	0.10-0.12	5.6-7.3	Low	Low	Moderate	0.17	4	2
	15-29	2.0-6.0	0.12-0.18	6.1-7.8	Low	Low	Moderate	0.24		
	29-60	>20	0.02-0.04	7.4-8.4	Low	Low	Low	0.10		
BpB: Boyer	0-15	2.0-6.0	0.10-0.15	5.6-7.3	Low	Low	Moderate	0.24	4	3
	15-32	2.0-6.0	0.12-0.18	5.6-7.8	Low	Low	Moderate	0.24		
	32-60	>20	0.02-0.04	7.4-8.4	Low	Low	Low	0.10		
CaB2, CaC2: Casco	0-5	0.6-2.0	0.20-0.24	5.6-7.3	Low	Low	Low	0.32	3	5
	5-20	0.6-2.0	0.12-0.19	5.6-7.8	Moderate	Low	Low	0.32		
	20-60	>20	0.02-0.04	7.4-8.4	Low	Low	Low	0.10		
CrD2*, CrE*:										
Casco	0-5	0.6-2.0	0.20-0.24	5.6-7.3	Low	Low	Low	0.32	3	5
	5-20	0.6-2.0	0.12-0.19	5.6-7.8	Moderate	Low	Low	0.32		
	20-60	>20	0.02-0.04	7.4-8.4	Low	Low	Low	0.10		
Rodman	0-13	2.0-6.0	0.09-0.12	6.6-7.8	Low	Low	Low	0.15	3	8
	13-60	>20	0.02-0.04	7.4-8.4	Low	Low	Low	0.10		
CtB, CtC: Chelsea	0-11	6.0-20	0.10-0.15	5.6-6.5	Low	Low	Low	0.17	5	2
	11-60	6.0-20	0.06-0.08	5.1-6.5	Low	Low	Low	0.17		
DcA: Del Rey	0-10	0.6-2.0	0.22-0.24	5.1-6.5	Low	High	Moderate	0.43	3	6
	10-26	0.06-0.2	0.12-0.20	5.6-8.4	Moderate	High	Low	0.43		
	26-60	0.06-0.2	0.18-0.22	7.9-8.4	Moderate	High	Low	0.43		
DdB: Dodge	0-10	0.6-2.0	0.22-0.24	5.6-7.3	Low	Low	Low	0.37	4	5
	10-33	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	Moderate	Moderate	0.37		
	33-38	0.6-2.0	0.16-0.19	5.1-6.5	Moderate	Moderate	Moderate	0.37		
	38-60	0.6-6.0	0.07-0.20	7.9-8.4	Low	Low	Low	0.37		
Ed: Edwards	0-21	2.0-6.0	0.35-0.45	5.6-7.8	-----------	High	Low	0.10	5	3
	21-46	0.06-0.2	---	7.4-8.4	-----------	High	Low	0.10		
	46-60	6.0-20	0.03-0.08	6.1-8.4	Low	High	Moderate	0.10		
Ev: Elvers	0-22	0.6-2.0	0.20-0.22	6.1-7.8	Low	High	Low	0.43	5	5
	22-60	2.0-6.0	0.35-0.45	6.1-7.3	-----------	High	Moderate	0.10		
Fn*. Fluvaquents										
FoC2, FsA, FsB: Fox	0-10	0.6-2.0	0.20-0.22	5.1-6.5	Low	Low	Moderate	0.37	3	5
	10-29	0.6-2.0	0.18-0.20	5.1-6.0	Moderate	Low	Moderate	0.37		
	29-33	0.6-2.0	0.12-0.14	6.1-7.8	Moderate	Low	Moderate	0.37		
	33-60	>6.0	0.02-0.04	7.9-8.4	Low	Low	Low	0.10		
Gd: Gilford	0-11	2.0-6.0	0.13-0.15	6.1-7.3	Low	High	Moderate	0.20	5	3
	11-29	2.0-6.0	0.12-0.14	6.1-7.3	Low	High	Moderate	0.20		
	29-60	6.0-20	0.05-0.08	6.6-8.4	Low	High	Low	0.15		
GsB: Grays	0-18	0.6-2.0	0.22-0.24	5.1-6.5	Low	Moderate	Moderate	0.32	5	6
	18-38	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	Moderate	Moderate	0.43		
	38-60	0.6-6.0	0.14-0.22	7.4-8.4	Low	Moderate	Low	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodi-bility group
	In	In/hr	In/in	pH						
GtB Grellton	0-14	0.6-2.0	0.13-0.18	5.6-6.5	Low	Low	Low	0.24	5	3
	14-35	0.6-2.0	0.13-0.22	6.1-7.3	Low	Low	Low	0.32		
	35-44	0.6-2.0	0.21-0.24	5.6-6.5	Low	Moderate	Low	0.32		
	44-60	0.6-2.0	0.10-0.22	6.1-8.4	Low	Low	Low	0.32		
GwB, GwC2 Griswold	0-12	0.6-2.0	0.13-0.15	6.1-7.3	Low	Low	Low	0.20	5	3
	12-25	0.6-2.0	0.14-0.19	6.1-7.3	Low	Moderate	Low	0.28		
	25-60	0.6-2.0	0.09-0.13	7.4-8.4	Low	Low	Low	0.28		
HeB Hebron	0-12	0.6-2.0	0.20-0.22	5.6-7.8	Low	Low	Low	0.32	5	6
	12-34	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32		
	34-40	0.2-0.6	0.10-0.20	7.4-8.4	Moderate	Moderate	Low	0.43		
	40-60	0.2-0.6	0.08-0.12	7.9-8.4	Moderate	Moderate	Low	0.43		
Ht Houghton	0-72	2.0-6.0	0.35-0.45	5.6-7.3	----------	High	Low	0.10	5	3
JuB Juneau	0-9	0.6-2.0	0.22-0.24	6.1-7.8	Low	Moderate	Moderate	0.37	5	5
	9-27	0.6-2.0	0.20-0.22	6.1-7.8	Low	Moderate	Moderate	0.37		
	27-52	0.6-2.0	0.18-0.22	5.6-7.8	Moderate	Moderate	Moderate	0.37		
	52-60	0.6-2.0	0.11-0.22	5.6-7.8	Moderate	High	Moderate	0.37		
Kb Keowns	0-7	0.6-2.0	0.20-0.24	6.6-8.4	Low	High	Low	0.32	5	5
	7-19	0.6-2.0	0.12-0.22	6.6-8.4	Low	High	Low	0.32		
	19-60	0.6-2.0	0.11-0.22	7.4-8.4	Low	High	Low	0.32		
KdA Kibbie	0-9	0.6-2.0	0.16-0.20	5.6-7.3	Low	High	Moderate	0.20	5	3
	9-35	0.6-2.0	0.15-0.19	5.6-7.3	Low	High	Moderate	0.43		
	35-60	0.6-2.0	0.12-0.22	7.4-8.4	Low	High	Low	0.43		
KeB, KeC2 Kidder	0-7	0.6-2.0	0.13-0.18	6.1-7.8	Low	Moderate	Low	0.24	5	3
	7-29	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32		
	29-60	2.0-6.0	0.09-0.11	7.4-7.8	Low	Low	Low	0.32		
KfB, KfC2, KfD2 Kidder	0-11	0.6-2.0	0.20-0.24	6.1-7.8	Low	Moderate	Low	0.32	5	5
	11-31	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32		
	31-60	2.0-6.0	0.09-0.11	7.4-7.8	Low	Low	Low	0.32		
KgB Kidder	0-14	0.6-2.0	0.20-0.24	6.1-7.8	Low	Moderate	Low	0.32	5	5
	14-34	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	Moderate	Low	0.32		
	34-60	2.0-6.0	0.09-0.11	7.4-7.8	Low	Low	Low	0.32		
LaB Lamartine	0-11	0.6-2.0	0.22-0.24	6.1-7.8	Low	High	Low	0.32	5	5
	11-25	0.6-2.0	0.18-0.22	6.1-7.8	Moderate	High	Low	0.43		
	25-30	0.6-2.0	0.15-0.19	6.1-7.8	Moderate	High	Low	0.43		
	30-60	0.6-6.0	0.17-0.19	7.4-8.4	Low	High	Low	0.32		
LyB Lorenzo	0-11	2.0-6.0	0.13-0.15	5.6-7.3	Low	Low	Moderate	0.20	3	3
	11-18	2.0-6.0	0.15-0.19	5.6-7.3	Low	Moderate	Moderate	0.28		
	18-60	>6.0	0.02-0.07	7.4-8.4	Low	Low	Low	0.10		
MgA, MgB Martinton	0-11	0.6-2.0	0.22-0.24	5.1-6.5	Low	High	Moderate	0.32	5	6
	11-30	0.2-0.6	0.11-0.20	5.6-7.8	Moderate	High	Moderate	0.43		
	30-60	0.06-0.2	0.11-0.22	7.4-8.4	Moderate	High	Low	0.43		
MmA Matherton	0-13	2.0-6.0	0.20-0.24	5.6-7.3	Low	High	Moderate	0.20	4	5
	13-29	0.6-2.0	0.16-0.18	5.6-7.3	Low	High	Moderate	0.32		
	29-60	6.0-20	0.02-0.04	7.4-8.4	Low	High	Low	0.10		
MnA Matherton	0-11	0.6-2.0	0.20-0.24	6.6-7.3	Low	Moderate	Low	0.32	4	5
	11-35	0.6-2.0	0.15-0.19	6.1-7.3	Moderate	Moderate	Low	0.32		
	35-48	<20	0.02-0.04	7.9-8.4	Low	Low	Low	0.10		
	48-60	0.2-0.6	0.10-0.20	7.9-8.4	Moderate	High	Low	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
MoB---------------- Mayville	0-12	0.6-2.0	0.22-0.24	5.6-7.3	Low--------	Moderate	Low------	0.37	4	5
	12-25	0.6-2.0	0.18-0.24	5.1-6.5	Moderate	Moderate	Moderate	0.37		
	25-38	0.6-2.0	0.15-0.20	5.1-6.5	Moderate	Moderate	Moderate	0.37		
	38-60	0.6-2.0	0.07-0.20	7.9-8.4	Low--------	Moderate	Low------	0.28		
MpB, MpC2---------- McHenry	0-12	0.6-2.0	0.22-0.24	5.6-7.3	Low--------	Low------	Moderate	0.37	5	5
	12-36	0.6-2.0	0.15-0.20	5.6-7.8	Moderate	High-----	Moderate	0.37		
	36-60	0.6-6.0	0.05-0.07	7.4-8.4	Low--------	Low------	Low------	0.28		
Mr----------------- Milford	0-11	0.6-2.0	0.12-0.23	6.1-7.3	High------	High-----	Low------	0.28	5	4
	11-28	0.2-0.6	0.11-0.20	6.6-7.8	High------	High-----	Low------	0.28		
	28-60	0.2-0.6	0.14-0.20	7.4-8.4	Moderate	High-----	Low------	0.28		
MvB---------------- Moundville	0-10	6.0-20	0.10-0.14	5.1-6.5	Low--------	Low------	Moderate	0.17	5	2
	10-26	6.0-20	0.09-0.13	5.1-6.5	Low--------	Low------	Moderate	0.17		
	26-60	6.0-20	0.05-0.12	6.1-7.3	Low--------	Low------	Moderate	0.17		
Ot----------------- Otter	0-60	0.6-2.0	0.22-0.24	5.6-7.8	Low--------	High-----	Low------	0.28	5	6
Pa, Pb------------- Palms	0-31	2.0-6.0	0.35-0.45	5.1-8.4	----------	High-----	Moderate	0.10	5	3
	31-60	0.6-2.0	0.14-0.22	6.1-8.4	Low--------	High-----	Low------	0.10		
Pg*. Pits										
RaA---------------- Radford	0-22	0.6-2.0	0.22-0.24	6.1-7.8	Low--------	High-----	Low------	0.28	5	6
	22-60	0.6-2.0	0.18-0.20	6.1-7.8	Moderate	High-----	Low------	0.28		
RnB---------------- Ringwood	0-14	0.6-2.0	0.22-0.24	5.6-7.3	Low--------	Moderate	Moderate	0.28	5	5
	14-20	0.6-2.0	0.16-0.20	5.6-7.3	Moderate	High-----	Moderate	0.43		
	20-39	0.6-2.0	0.15-0.19	5.6-7.3	Low--------	High-----	Low------	0.32		
	39-60	2.0-6.0	0.08-0.13	7.4-8.4	Low--------	Low------	Low------	0.32		
RtB, RtC2, RtD2, RtE2-------------- Rotamer	0-7	0.6-2.0	0.20-0.24	6.6-7.3	Low--------	Low------	Low------	0.28	3	5
	7-13	0.6-2.0	0.14-0.18	6.1-7.8	Moderate	Moderate	Low------	0.28		
	13-60	2.0-6.0	0.09-0.11	7.4-7.8	Low--------	Low------	Low------	0.20		
SbA, SbB----------- St. Charles	0-15	0.6-2.0	0.22-0.24	5.6-7.3	Low--------	Moderate	Moderate	0.37	5	6
	15-45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	Moderate	Moderate	0.37		
	45-60	0.6-2.0	0.11-0.22	5.6-8.4	Low--------	Low------	Low------	0.37		
SfB---------------- St. Charles	0-6	0.6-2.0	0.22-0.24	6.6-7.3	Low--------	Moderate	Low------	0.37	5	6
	6-44	0.6-2.0	0.18-0.20	5.6-6.5	Moderate	Moderate	Low------	0.37		
	44-51	0.6-2.0	0.16-0.18	6.1-6.5	Moderate	Moderate	Low------	0.37		
	51-60	>20	0.05-0.07	7.4-8.4	Low--------	Low------	Low------	0.10		
ShB---------------- Salter	0-9	2.0-6.0	0.10-0.13	5.6-7.8	Low--------	Low------	Low------	0.17	5	2
	9-21	0.6-2.0	0.10-0.19	6.6-8.4	Low--------	Low------	Low------	0.20		
	21-60	0.6-2.0	0.14-0.16	7.4-8.4	Low--------	Low------	Low------	0.43		
SkB---------------- Saylesville	0-10	0.6-2.0	0.20-0.24	5.6-7.8	Low--------	Low------	Moderate	0.37	3	5
	10-41	0.2-0.6	0.09-0.13	5.6-7.8	Moderate	High-----	Low------	0.37		
	41-60	0.2-0.6	0.11-0.22	7.4-8.4	Moderate	High-----	Low------	0.37		
SlC2--------------- Saylesville	0-7	0.6-2.0	0.21-0.23	5.6-7.8	Moderate	High-----	Moderate	0.37	2	7
	7-27	0.2-0.6	0.09-0.13	5.6-7.8	Moderate	High-----	Low------	0.37		
	27-60	0.2-0.6	0.11-0.22	7.9-8.4	Moderate	High-----	Low------	0.37		
Sm----------------- Sebewa	0-11	0.6-2.0	0.20-0.22	6.1-7.8	Low--------	High-----	Low------	0.24	5	5
	11-27	0.6-2.0	0.15-0.19	6.1-7.8	Low--------	High-----	Low------	0.32		
	27-60	6.0-20	0.02-0.04	7.4-8.4	Low--------	High-----	Low------	0.10		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Sn------------------ Sebewa	0-13	0.6-2.0	0.22-0.24	6.6-7.8	Low--------	High-----	Low------	0.28	5	5
	13-27	0.6-2.0	0.15-0.19	6.6-7.8	Moderate	High-----	Low------	0.28		
	27-42	6.0-20	0.03-0.05	7.4-8.4	Low--------	High-----	Low------	0.10		
	42-60	<0.06	0.10-0.12	7.4-8.4	Moderate	High-----	Low------	0.32		
SoB, SoC2----------- Sisson	0-8	0.6-2.0	0.13-0.18	6.1-7.3	Low--------	Low------	Low------	0.24	5	3
	8-20	0.6-2.0	0.17-0.22	6.1-7.8	Low--------	Low------	Low------	0.43		
	20-60	0.6-2.0	0.05-0.22	7.4-8.4	Low--------	Low------	Low------	0.43		
ThB, ThC2----------- Theresa	0-9	0.6-2.0	0.22-0.24	6.1-7.8	Low--------	Low------	Low------	0.32	4	5
	9-18	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	Moderate	Low------	0.43		
	18-30	0.6-2.0	0.15-0.19	6.6-8.4	Moderate	Moderate	Low------	0.43		
	30-60	0.6-2.0	0.08-0.17	7.4-8.4	Low--------	Moderate	Low------	0.43		
TuA, TuB------------ Tuscola	0-10	0.6-2.0	0.20-0.24	5.6-7.3	Low--------	Moderate	Low------	0.24	5	5
	10-29	0.6-2.0	0.15-0.19	5.6-7.3	Moderate	Moderate	Low------	0.32		
	29-60	0.6-2.0	0.14-0.18	7.4-8.4	Low--------	Moderate	Low------	0.32		
Ud*. Udorthents										
VrB----------------- Virgil	0-10	0.6-2.0	0.22-0.24	5.1-7.3	Low--------	High-----	Moderate	0.32	5	6
	10-41	0.2-2.0	0.18-0.22	5.1-7.3	Moderate	High-----	Moderate	0.43		
	41-60	0.6-6.0	0.05-0.11	6.6-8.4	Low--------	High-----	Low------	0.28		
VwA----------------- Virgil	0-11	0.6-2.0	0.22-0.24	6.1-7.3	Low--------	High-----	Moderate	0.32	5	5
	11-41	0.2-2.0	0.18-0.22	5.1-6.5	Moderate	High-----	Moderate	0.43		
	41-46	0.2-2.0	0.16-0.18	5.6-7.3	Moderate	High-----	Low------	0.28		
	46-60	>20	0.05-0.07	7.4-8.4	Low--------	High-----	Low------	0.10		
Wa------------------ Wacousta	0-19	0.2-2.0	0.21-0.23	6.6-7.8	High-------	High-----	Low------	0.28	5	7
	19-60	0.6-2.0	0.20-0.22	7.4-8.4	High-------	High-----	Low------	0.43		
WmA----------------- Wasepi	0-9	2.0-6.0	0.13-0.15	5.6-7.3	Low--------	Moderate	Moderate	0.20	4	3
	9-38	2.0-6.0	0.12-0.18	5.6-7.3	Low--------	Moderate	Moderate	0.20		
	38-60	>20.0	0.02-0.04	7.4-7.8	Low--------	Moderate	Low------	0.10		
WtA----------------- Watseka Variant	0-18	6.0-20	0.10-0.12	6.6-8.4	Low--------	Low------	Low------	0.17	5	2
	18-60	6.0-20	0.05-0.12	6.6-8.4	Low--------	Low------	Low------	0.17		
WvA, WvB------------ Wauconda	0-13	0.6-2.0	0.22-0.24	5.6-7.8	Low--------	High-----	Low------	0.32	4-3	5
	13-32	0.6-2.0	0.18-0.20	5.6-7.8	Moderate	High-----	Moderate	0.43		
	32-60	0.6-6.0	0.05-0.22	7.4-8.4	Low--------	High-----	Low------	0.32		
WxB, WxC2----------- Whalan	0-11	0.6-2.0	0.22-0.24	5.1-7.3	Low--------	Moderate	Low------	0.32	4	6
	11-33	0.6-2.0	0.17-0.19	5.1-6.5	Moderate	Moderate	Low------	0.32		
	33-36	0.2-0.6	0.15-0.19	5.1-7.8	High-------	High-----	Moderate	0.32		
	36+									
WyA----------------- Whalan Variant	0-9	0.6-2.0	0.22-0.24	5.6-7.8	Low--------	High-----	Low------	0.37	4	5
	9-12	0.6-2.0	0.13-0.15	5.6-7.8	Low--------	High-----	Low------	0.37		
	12-22	0.6-2.0	0.15-0.19	5.1-7.8	Moderate	High-----	Low------	0.37		
	22-27	0.2-0.6	0.09-0.11	7.4-8.4	Moderate	High-----	Low------	0.37		
	27+									
YaA----------------- Yahara	0-24	0.6-2.0	0.15-0.22	6.1-8.4	Low--------	Moderate	Low------	0.32	5	3
	24-60	0.6-2.0	0.14-0.16	7.9-8.4	Low--------	Moderate	Low------	0.43		

* See map unit description for the composition and behavior of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Ad: Adrian	A/D	Frequent	Long	Nov-May	0-1.0	Apparent	Nov-May	>60	---	High.
AzA: Aztalan	C	Rare	---	---	1.0-3.0	Apparent	Nov-Jun	>60	---	High.
BaA: Barry	B/D	Rare	---	---	0-1.0	Apparent	Jan-May	>60	---	High.
BoC, BpB: Boyer	B	None	---	---	>6.0	---	---	>60	---	Low.
CaB2, CaC2: Casco	B	None	---	---	>6.0	---	---	>60	---	Moderate.
CrD2*, CrE*:										
Casco	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Rodman	A	None	---	---	>6.0	---	---	>60	---	Low.
CtB, CtC: Chelsea	A	None	---	---	>6.0	---	---	>60	---	Low.
DcA: Del Rey	C	None	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High.
DdB: Dodge	B	None	---	---	>6.0	---	---	>60	---	High.
Ed: Edwards	B/D	Frequent	Long	Sep-May	0-0.5	Apparent	Sep-Jun	>60	---	High.
Ev: Elvers	B/D	Frequent	Long	Nov-May	0-1.0	Apparent	Nov-May	>60	---	High.
Fn*. Fluvaquents										
FoC2, FsA, FsB: Fox	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Gd: Gilford	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	>60	---	High.
GsB: Grays	B	None	---	---	>3.0	Apparent	Feb-Apr	>60	---	High.
GtB: Grellton	B	None	---	---	>3.0	Apparent	Nov-May	>60	---	Moderate.
GwB, GwC2: Griswold	B	None	---	---	>6.0	---	---	>60	---	Moderate.
HeB: Hebron	C	None	---	---	>3.0	Apparent	Mar-May	>60	---	Moderate.
Ht: Houghton	A/D	Frequent	Long	Nov-May	0-1.0	Apparent	Sep-Jun	>60	---	High.
JuB: Juneau	B	Occasional	Brief	Nov-May	>3.0	Apparent	Nov-May	>60	---	High.
Kb: Keowns	B/D	Frequent	Brief	Mar-Apr	0-1.0	Apparent	Oct-May	>60	---	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action
					Ft			In		
KdA: Kibbie	B	Rare	---	---	1.5-2.0	Apparent	Nov-May	>60	---	High.
KeB, KeC2, KfB, KfC2, KfD2: Kidder	B	None	---	---	>6.0	---	---	>60	---	Moderate.
KgB: Kidder	B	None	---	---	>2.5	Apparent	Nov-May	>60	---	Moderate.
LaB: Lamartine	C	Occasional	Very brief	Nov-May	1.0-3.0	Apparent	Nov-May	>60	---	High.
LyB: Lorenzo	B	None	---	---	>6.0	---	---	>60	---	Low.
MgA, MgB: Martinton	C	None	---	---	1.0-3.0	Apparent	Feb-May	>60	---	High.
MmA: Matherton	B	Rare	---	---	1.0-2.0	Apparent	Nov-May	>60	---	High.
MnA: Matherton	B	Occasional	Brief	Feb-Apr	1.0-3.0	Apparent	Dec-Jun	>60	---	High.
MoB: Mayville	B	None	---	---	3.0-5.0	Apparent	Nov-Apr	>60	---	High.
MpB, MpC2: McHenry	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Mr: Milford	B/D	Occasional	Brief	Apr-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High.
MvB: Moundville	A	None	---	---	2.5-3.5	Apparent	Mar-May	>60	---	Low.
Ot: Otter	B/D	Frequent	Brief	Apr-Jun	0-2.0	Apparent	Apr-Jun	>60	---	High.
Pa, Pb: Palms	A/D	Frequent	Long	Nov-May	0-1.0	Apparent	Nov-May	>60	---	High.
Pg*. Pits										
RaA: Radford	B	Frequent	Brief	Mar-Jun	1.0-3.0	Apparent	Mar-Jun	>60	---	High.
RnB: Ringwood	B	None	---	---	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate.
RtB, RtC2, RtD2, RtE2: Rotamer	B	None	---	---	>6.0	---	---	>60	---	Moderate.
SbA, SbB: St. Charles	B	None	---	---	>3.0	Apparent	Nov-May	>60	---	High.
SfB: St. Charles	B	None	---	---	2.5-3.5	Perched	Feb-May	>60	---	High.
ShB: Salter	B	None	---	---	3.0-6.0	Apparent	Mar-May	>60	---	Moderate.
SkB, SlC2: Saylesville	C	None	---	---	3.5-6.0	Apparent	Nov-May	>60	---	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Sm----------------- Sebewa	B/D	Frequent----	Brief-----	Mar-May	0-1.0	Apparent	Sep-May	>60	---	High.
Sn----------------- Sebewa	B/D	Frequent----	Brief-----	Feb-Jun	0-1.0	Apparent	Sep-May	>60	---	High.
SoB, SoC2---------- Sisson	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
ThB, ThC2---------- Theresa	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
TuA, TuB----------- Tuscola	B	None--------	---	---	2.0-3.5	Apparent	Nov-Apr	>60	---	High.
Ud*. Udorthents										
VrB---------------- Virgil	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High.
VwA---------------- Virgil	B	Frequent----	Brief-----	Feb-Jun	1.0-3.0	Apparent	Sep-Jun	>60	---	High.
Wa----------------- Wacousta	B/D	Frequent----	Very brief to very long.	Apr-Jul	0-2.0	Apparent	Nov-Jun	>60	---	High.
WmA---------------- Wasepi	B	Rare--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	High.
WtA---------------- Watseka Variant	A	None--------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	Moderate.
WvA, WvB----------- Wauconda	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High.
WxB, WxC2---------- Whalan	B	None--------	---	---	>6.0	---	---	20-40	Rip-pable	Moderate.
WyA---------------- Whalan Variant	B	Rare--------	---	---	1.0-3.0	Apparent	Sep-Jun	20-40	Hard	High.
YaA---------------- Yahara	C	Rare--------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	High.

* See map unit description for the composition and behavior of the map unit.

TABLE 17.--ENGINEERING TEST DATA

[Tests performed by the Wisconsin Department of Transportation, Division of Highways. Absence of an entry indicates that no determination was made]

Soil name and location	Parent material	Report number	Depth	Moisture density: Maximum density	Moisture density: Optimum moisture	Percentage passing sieve--1/: No. 4	No. 10	No. 40	No. 200	Percentage smaller than--1/: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Classification: Unified
			In	lb/cu ft	Pct									Pct			
Aztalan fine sandy loam: NE1/4NW1/4 sec. 29, T. 5 N., R. 16 E. (Modal)	Loamy outwash and lacustrine deposits.	S74WI-28-1															
		1-1	19-25	---	---	---	100	94	50	50	49	36	27	32.8	17.2	A-6(6)	SC
		1-2	29-60	109.2	17.0	---	100	99	97	97	92	55	36	38.4	20.0	A-6(12)	CL
Dodge silt loam: SW1/4NE1/4 sec. 4, T. 7 N., R. 14 E. (Modal)	Loess and loamy glacial till.	S74WI-28-4															
		4-1	23-32	---	---	---	100	98	79	76	59	34	28	38.4	19.6	A-6(12)	CL
		4-2	37-60	124.6	8.4	84	81	73	21	16	9	5	3	---	NP	A-2-4	SM
Gilford sandy loam: SW1/4NE1/4 sec. 5, T. 6 N., R. 16 E. (Modal)	Loamy deposits and glacial outwash.	S74WI-28-5															
		5-1	19-26	---	---	97	95	83	54	53	39	19	14	26.6	9.9	A-4(4)	CL
		5-2	30-60	---	---	90	82	38	6	5	3	1	1	---	NP	A-1-6 (0)	SP-SM
Griswold sandy loam: NW1/4NW1/4 sec. 32, T. 5 N., R. 15 E. (Modal)	Loamy glacial till.	S73WI-28-3															
		3-1	16-21	---	---	---	100	94	73	72	70	54	45	45.8	26.3	A-7-6 (15)	CL
		3-2	23-60	134.9	7.4	79	73	60	26	23	15	8	5	---	NP	A-2-4 (0)	SM
Hebron loam: NE1/4SW1/4 sec. 15, T. 6 N., R. 14 E. (Modal)	Loamy lacustrine deposits.	S74WI-28-2															
		2-1	26-36	---	---	98	96	86	44	43	39	30	24	31.5	17.0	A-6(4)	SC
		2-2	41-56	113.3	15.0	---	100	98	85	83	71	45	31	28.1	13.3	A-6(9)	CL
Keowns silt loam: NW1/4SW1/4 sec. 21, T. 5 N., R. 16 E. (Modal)	Loamy lacustrine deposits.	S72WI-28-8															
		8-1	23-32	---	---	---	---	---	48	22	6	3	2	---	NP	A-4(3)	SM
		8-2	32-60	---	---	---	---	---	97	88	45	15	10	---	NP	A-4(8)	ML
Kibbie fine sandy loam: SW1/4SE1/4 sec. 12, T. 8 N., R. 16 E. (Modal)	Loamy lacustrine deposits.	S72WI-28-1															
		1-1	16-22	---	---	---	100	98	64	59	47	38	33	45.0	26.4	A-7-6 (13)	CL
		1-2	26-60	---	---	---	100	99	48	31	10	5	4	---	NP	A-4(3)	SM
Kidder loam: NE1/4NE1/4 sec. 31, T. 7 N., R. 15 E. (Modal)	Loamy glacial till.	S73WI-28-2															
		2-1	14-24	---	---	100	98	85	48	47	43	34	29	40.4	23.9	A-6(7)	SC
		2-2	36-42	---	---	82	77	64	25	22	16	10	7	---	NP	A-2(4)	SM

See footnote at end of table.

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density: Maximum density	Moisture density: Optimum moisture	Percentage passing sieve--1/: No. 4	No. 10	No. 40	No. 200	Percentage smaller than--1/: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Classification: Unified
			In	lb/cu ft	Pct									Pct			
Lamartine silt loam: SE1/4NE1/4 sec. 16, T. 8 N., R. 16 E. (Modal)	Loess and loamy glacial till.	S72WI-28-6 6-1	14-25	---	---	---	100	99	95	92	75	44	36	56.2	33.6	A-7-6 (19)	CH
		6-2	30-60	---	---	81	76	67	38	32	21	12	8	16.1	3.1	A-4(1)	SM
Martinton silt loam: NE1/4SW1/4 sec. 36, T. 8 N., R. 14 E. (Modal)	Loamy and clayey lacustrine deposits.	S72WI-28-2 2-1	15-18	---	---	---	100	99	97	96	93	63	49	50.5	26.8	A-7-6 (17)	CH
		2-2	30-60	110.3	18.7	---	100	99	98	98	97	74	51	43.0	23.8	A-7-6 (14)	CL
Matherton silt loam: SW1/4NE1/4 sec. 8, T. 8 N., R. 15 E. (Modal)	Loamy deposits and glacial outwash.	S73WI-28-5 5-1	13-18	---	---	96	93	70	33	32	27	18	15	26.4	12.2	A-2-6 (1)	SC
		5-2	33-60	---	---	94	89	44	7	7	5	2	2	---	NP	A-1-6 (0)	SP-SM
Saylesville silt loam: SE1/4SE1/4 sec. 14, T. 5 N., R. 16 E. (Modal)	Silty and clayey lacustrine deposits.	S61WI-28-1 1-1	8-18	102.0	23.0	---	100	99	97	97	95	74	62	64.0	38.0	A-7-6 (20)	CH
		1-2	18-60	107.0	15.0	---	---	---	99	99	97	56	36	36.0	17.0	A-6(11)	CL
Sisson fine sandy loam: SW1/4NW1/4 sec. 10, T. 6 N., R. 15 E. (Modal)	Loamy lacustrine deposits.	S74WI-28-3 3-1	15-20	---	---	98	97	91	46	40	29	17	13	24.4	7.3	A-4(2)	SC
		3-2	25-60	102.9	16.0	---	---	100	9	5	2	2	1	---	NP	A-3(0)	SP-SM
Theresa silt loam: SE1/4SW1/4 sec. 12, T. 8 N., R. 16 E. (Modal)	Loess and loamy glacial till.	S73WI-28 10-10-1	26-30	---	---	100	98	89	59	57	51	39	34	43.6	25.3	A-7-6 (11)	CL
		10-10-2	30-60	125.9	10.7	90	87	80	54	44	23	12	8	---	NP	A-4(4)	ML
Wacousta silty clay loam: SE1/4NE1/4 sec. 8, T. 8 N., R. 16 E. (Modal)	Silty lacustrine deposits.	S72WI-28-3 3-1	13-23	---	---	---	---	---	99	96	68	33	25	43.2	23.4	A-7-6 (14)	CL
		3-2	34-60	---	---	---	100	99	98	94	59	25	19	35.9	14.3	A-6(10)	CL

See footnote at end of table.

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report number	Depth	Moisture density		Percentage passing sieve--1/				Percentage smaller than--1/				Liquid limit	Plasticity index	Classification	
				Maximum density	Optimum moisture	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO	Unified
			In	lb/cu ft	Pct									Pct			
Yahara fine sandy loam: NW1/4SW1/4 sec. 21, T. 5 N., R. 16 E. (Modal)	Loamy outwash and lacustrine deposits.	S72WI-28-7 7-1	14-30	---	---	---	---	100	14	8	4	3	2	---	NP	A-2-4 (0)	SM
		7-2	30-60	109.5	14.8	---	---	100	54	25	7	4	3	---	NP	A-4(4)	ML

1/Mechanical analysis according to the AASHTO Designation T88-57 (1). Results from this procedure can differ somewhat from the results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all material up to and including that 3 inches in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fraction. The mechanical analysis data used in this table are not suitable for use in naming textural classes of soils.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Aztalan	Fine-loamy, mixed, mesic Aquic Argiudolls
*Barry	Fine-loamy, mixed, mesic Typic Argiaquolls
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Chelsea	Mixed, mesic Alfic Udipsamments
Del Rey	Fine, illitic, mesic Aeric Ochraqualfs
Dodge	Fine-silty, mixed, mesic Typic Hapludalfs
Edwards	Marly, euic, mesic Limnic Medisaprists
*Elvers	Coarse-silty, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Fluvaquents	Loamy, mixed, nonacid, mesic Fluvaquents
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Gilford	Coarse-loamy, mixed, mesic Typic Haplaquolls
Grays	Fine-silty, mixed, mesic Mollic Hapludalfs
Grellton	Fine-loamy, mixed, mesic Typic Hapludalfs
Griswold	Fine-loamy, mixed, mesic Typic Argiudolls
Hebron	Fine-loamy, mixed, mesic Typic Hapludalfs
Houghton	Euic, mesic Typic Medisaprists
Juneau	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
*Keowns	Coarse-loamy, mixed, nonacid, mesic Mollic Haplaquepts
Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Kidder	Fine-loamy, mixed, mesic Typic Hapludalfs
Lamartine	Fine-silty, mixed, mesic Aquollic Hapludalfs
Lorenzo	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiudolls
Martinton	Fine, illitic, mesic Aquic Argiudolls
Matherton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Udollic Ochraqualfs
Mayville	Fine-silty, mixed, mesic Typic Hapludalfs
McHenry	Fine-loamy, mixed, mesic Typic Hapludalfs
*Milford	Fine, mixed, mesic Typic Haplaquolls
Moundville	Sandy, mixed, mesic Psammentic Hapludalfs
Otter	Fine-silty, mixed, mesic Cumulic Haplaquolls
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
*Radford	Fine-silty, mixed, mesic Fluventic Hapludolls
Ringwood	Fine-loamy, mixed, mesic Typic Argiudolls
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Rotamer	Fine-loamy, mixed, mesic Typic Argiudolls
Salter	Coarse-loamy, mixed, mesic Typic Eutrochrepts
Saylesville	Fine, illitic, mesic Typic Hapludalfs
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiaquolls
Sisson	Fine-loamy, mixed, mesic Typic Hapludalfs
St. Charles	Fine-silty, mixed, mesic Typic Hapludalfs
*Theresa	Fine-loamy, mixed, mesic Typic Hapludalfs
Tuscola	Fine-loamy, mixed, mesic Aquic Hapludalfs
Udorthents	Loamy and clayey, mixed, nonacid, mesic Udorthents
Virgil	Fine-silty, mixed, mesic Udollic Ochraqualfs
Wacousta	Fine-silty, mixed, mesic Typic Haplaquolls
Wasepi	Coarse-loamy, mixed, mesic Aquollic Hapludalfs
Watseka Variant	Sandy, mixed, mesic Aquic Hapludolls
Wauconda	Fine-silty, mixed, mesic Udollic Ochraqualfs
Whalan	Fine-loamy, mixed, mesic Typic Hapludalfs
Whalan Variant	Fine-loamy, mixed, mesic Aquic Hapludalfs
Yahara	Coarse-loamy, mixed, mesic Aquic Hapludolls

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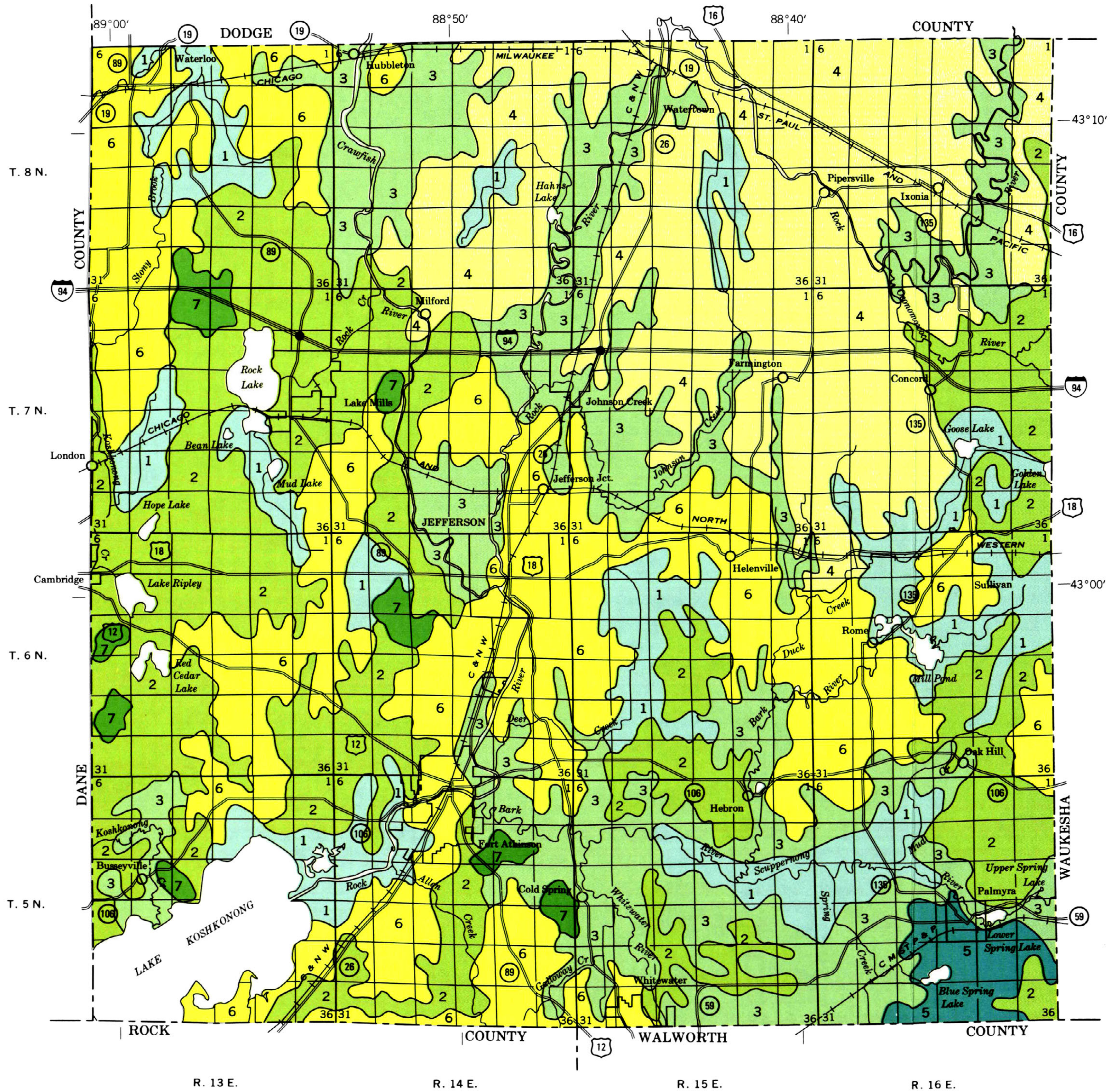
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RESEARCH DIVISION
COLLEGE OF AGRICULTURAL AND LIFE SCIENCES
UNIVERSITY OF WISCONSIN

GENERAL SOIL MAP

JEFFERSON COUNTY, WISCONSIN

Scale 1:190,080

1 0 1 2 3 4 Miles



SOIL LEGEND

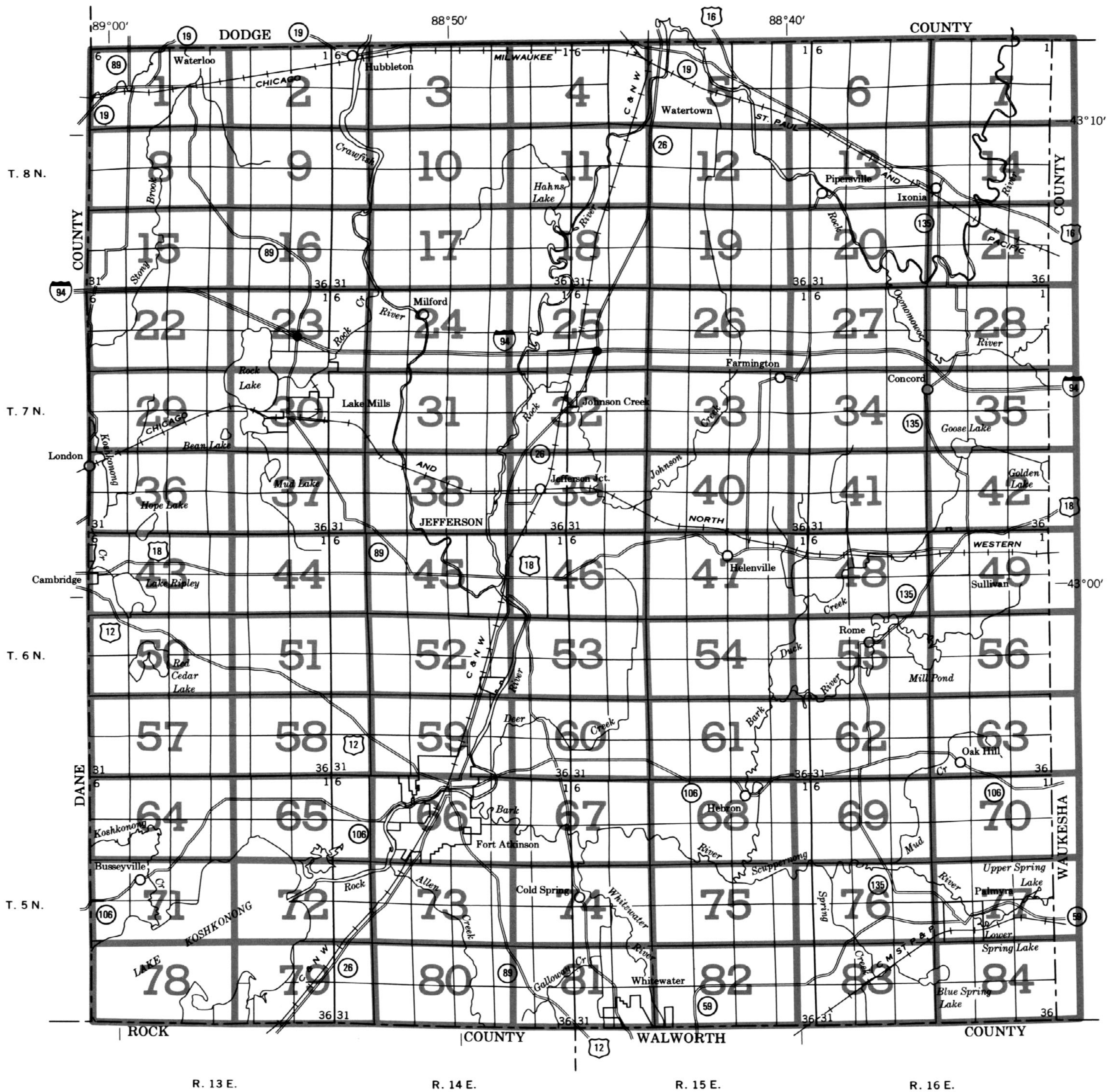
1	Houghton–Adrian: Very poorly drained, nearly level organic soils that are more than 51 inches thick or are underlain by sandy material within a depth of 51 inches
2	Fox–Casco–Matherton: Somewhat poorly drained, well drained, and somewhat excessively drained, nearly level to very steep soils that have a loamy subsoil and are underlain by sand and gravel
3	Palms–Keowns–Milford: Very poorly drained and poorly drained, nearly level soils that are organic or have a loamy or clayey subsoil and are underlain by silty, sandy, or clayey material
4	Wacousta–Lamartine–Theresa: Very poorly drained, poorly drained, somewhat poorly drained, and well drained, nearly level to sloping soils that have a silty or loamy subsoil and are underlain by silt loam, sandy loam, or gravelly sandy loam
5	Rodman–Moundville–Casco: Excessively drained to moderately well drained, nearly level to very steep soils that have a loamy or sandy subsoil and are underlain by sand or sand and gravel
6	Kidder–McHenry–Rotamer: Well drained and moderately well drained, gently sloping to steep soils that have a loamy subsoil and are underlain by gravelly sandy loam
7	Whalan–Kidder: Well drained and moderately well drained, gently sloping to moderately steep soils that have a dominantly loamy subsoil and are underlain by dolomite bedrock or gravelly sandy loam

Compiled 1978

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



INDEX TO MAP SHEETS

JEFFERSON COUNTY, WISCONSIN

Scale 1:190,080

1 0 1 2 3 4 Miles

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

The first capital letter is the initial one of the soil name. The lower case letter that follows separates mapping units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for soils with a slope range of 0 to 2 percent or they are for miscellaneous areas with a considerable range of slope. A final number 2 in the symbol indicates that the soil is eroded.

SYMBOL	NAME
Ad	Adrian muck
AzA	Aztalan fine sandy loam, 0 to 3 percent slopes
BaA	Barry silt loam, 0 to 3 percent slopes
BoC	Boyer loamy sand, 6 to 12 percent slopes
BpB	Boyer sandy loam, 1 to 6 percent slopes
CaB2	Casco loam, 2 to 6 percent slopes, eroded
CaC2	Casco loam, 6 to 12 percent slopes, eroded
CrD2	Casco–Rodman complex, 12 to 20 percent slopes, eroded
CrE	Casco–Rodman complex, 20 to 45 percent slopes
CtB	Chelsea loamy fine sand, 1 to 6 percent slopes
CtC	Chelsea loamy fine sand, 6 to 20 percent slopes
DcA	Del Rey silt loam, 0 to 3 percent slopes
DdB	Dodge silt loam, 2 to 6 percent slopes
Ed	Edwards muck
Ev	Elvers silt loam
Fn	Fluvaquents
FoC2	Fox loam, 6 to 12 percent slopes, eroded
FsA	Fox silt loam, 0 to 2 percent slopes
FsB	Fox silt loam, 2 to 6 percent slopes
Gd	Gilford sandy loam
GsB	Grays silt loam, 2 to 6 percent slopes
GtB	Grellton fine sandy loam, 2 to 6 percent slopes
GwB	Griswold sandy loam, 2 to 6 percent slopes
GwC2	Griswold sandy loam, 6 to 12 percent slopes, eroded
HeB	Hebron loam, 1 to 6 percent slopes
Ht	Houghton muck
JuB	Juneau silt loam, 1 to 6 percent slopes
Kb	Keowns silt loam
KdA	Kibbie fine sandy loam, 0 to 3 percent slopes
KeB	Kidder sandy loam, 2 to 6 percent slopes
KeC2	Kidder sandy loam, 6 to 12 percent slopes, eroded
KfB	Kidder loam, 2 to 6 percent slopes
KfC2	Kidder loam, 6 to 12 percent slopes, eroded
KfD2	Kidder loam, 12 to 20 percent slopes, eroded
KgB	Kidder loam, moderately well drained, 2 to 6 percent slopes
LaB	Lamartine silt loam, 2 to 6 percent slopes
LyB	Lorenzo sandy loam, 2 to 6 percent slopes
MgA	Martinton silt loam, 0 to 2 percent slopes
MgB	Martinton silt loam, 2 to 6 percent slopes
MmA	Matherton silt loam, 0 to 3 percent slopes
MnA	Matherton silt loam, clayey substratum, 0 to 3 percent slopes
MoB	Mayville silt loam, 2 to 6 percent slopes
MpB	McHenry silt loam, 2 to 6 percent slopes
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded
Mr	Milford silty clay loam
MvB	Moundville loamy sand, 1 to 6 percent slopes
Ot	Otter silt loam
Pa	Palms muck
Pb	Palms muck, ponded
Pg	Pits, gravel
RaA	Radford silt loam, 0 to 3 percent slopes
RnB	Ringwood silt loam, 2 to 6 percent slopes
RtB	Rotamer loam, 2 to 6 percent slopes
RtC2	Rotamer loam, 6 to 12 percent slopes, eroded
RtD2	Rotamer loam, 12 to 20 percent slopes, eroded
RtE2	Rotamer loam, 20 to 30 percent slopes, eroded
SbA	St. Charles silt loam, moderately well drained, 0 to 2 percent slopes
SbB	St. Charles silt loam, moderately well drained, 2 to 6 percent slopes
SfB	St. Charles silt loam, moderately well drained, gravelly substratum, 2 to 6 percent slopes
ShB	Salter loamy sand, 2 to 6 percent slopes
SkB	Saylesville silt loam, 2 to 6 percent slopes
SlC2	Saylesville silty clay loam, 6 to 12 percent slopes, eroded
Sm	Sebewa silt loam
Sn	Sebewa silt loam, clayey substratum
SoB	Sisson fine sandy loam, 1 to 6 percent slopes
SoC2	Sisson fine sandy loam, 6 to 12 percent slopes, eroded
ThB	Theresa silt loam, 2 to 6 percent slopes
ThC2	Theresa silt loam, 6 to 12 percent slopes, eroded
TuA	Tuscola silt loam, 0 to 2 percent slopes
TuB	Tuscola silt loam, 2 to 6 percent slopes
Ud	Udorthents
VrB	Virgil silt loam, 2 to 6 percent slopes
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes
Wa	Wacousta silty clay loam
WmA	Wasepi sandy loam, 0 to 3 percent slopes
WtA	Watseka Variant loamy sand, 0 to 3 percent slopes
WvA	Wauconda silt loam, 0 to 2 percent slopes
WvB	Wauconda silt loam, 2 to 6 percent slopes
WxB	Whalan loam, 2 to 6 percent slopes
WxC2	Whalan loam, 6 to 12 percent slopes, eroded
WyA	Whalan Variant silt loam, 0 to 3 percent slopes
YaA	Yahara fine sandy loam, 0 to 3 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CeA; FoB2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) (S)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Spot of cut and fill land

1

N

1 Mile
5 000 Feet
Scale 1:15 840
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

JEFFERSON COUNTY, WISCONSIN NO. 1

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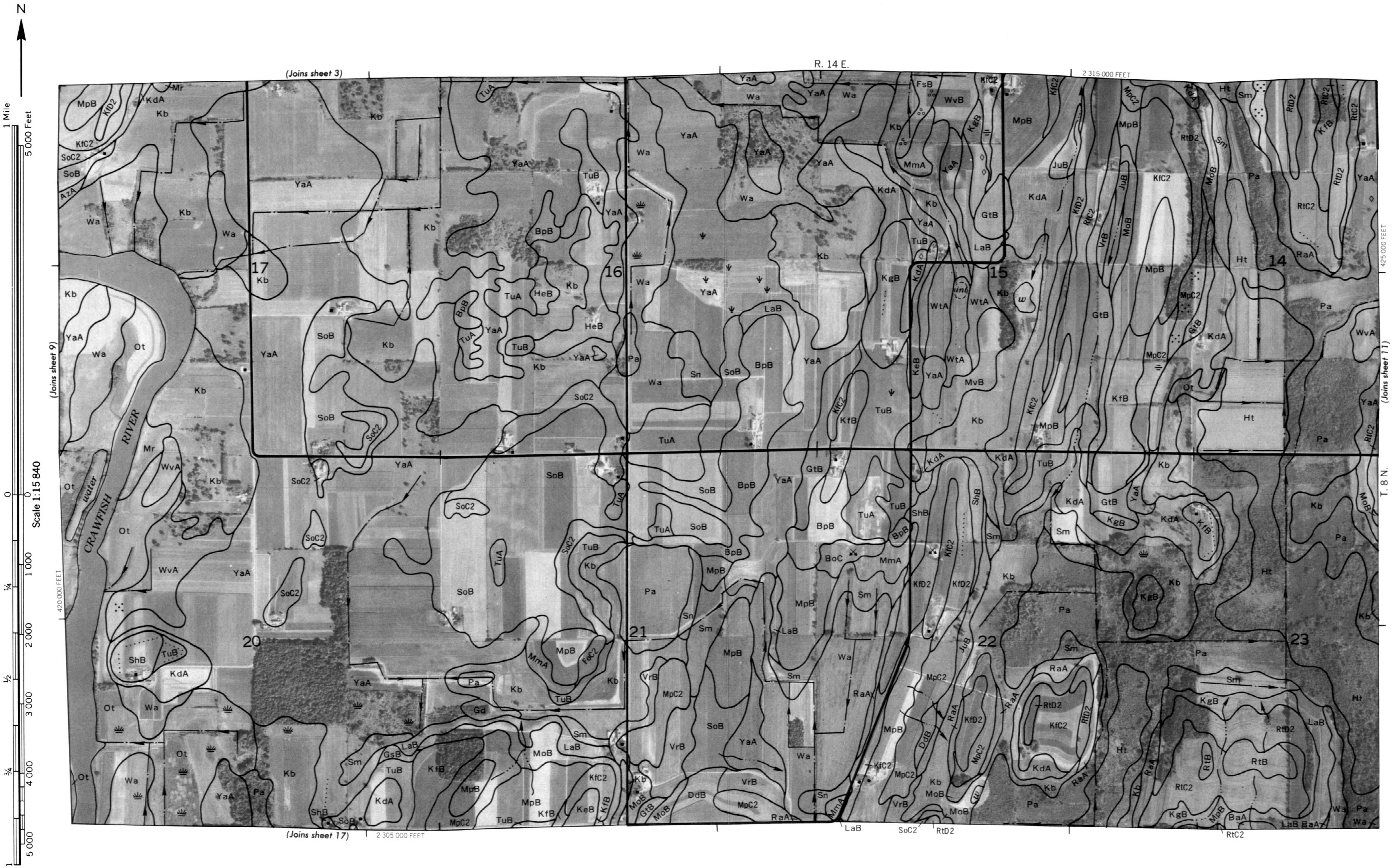

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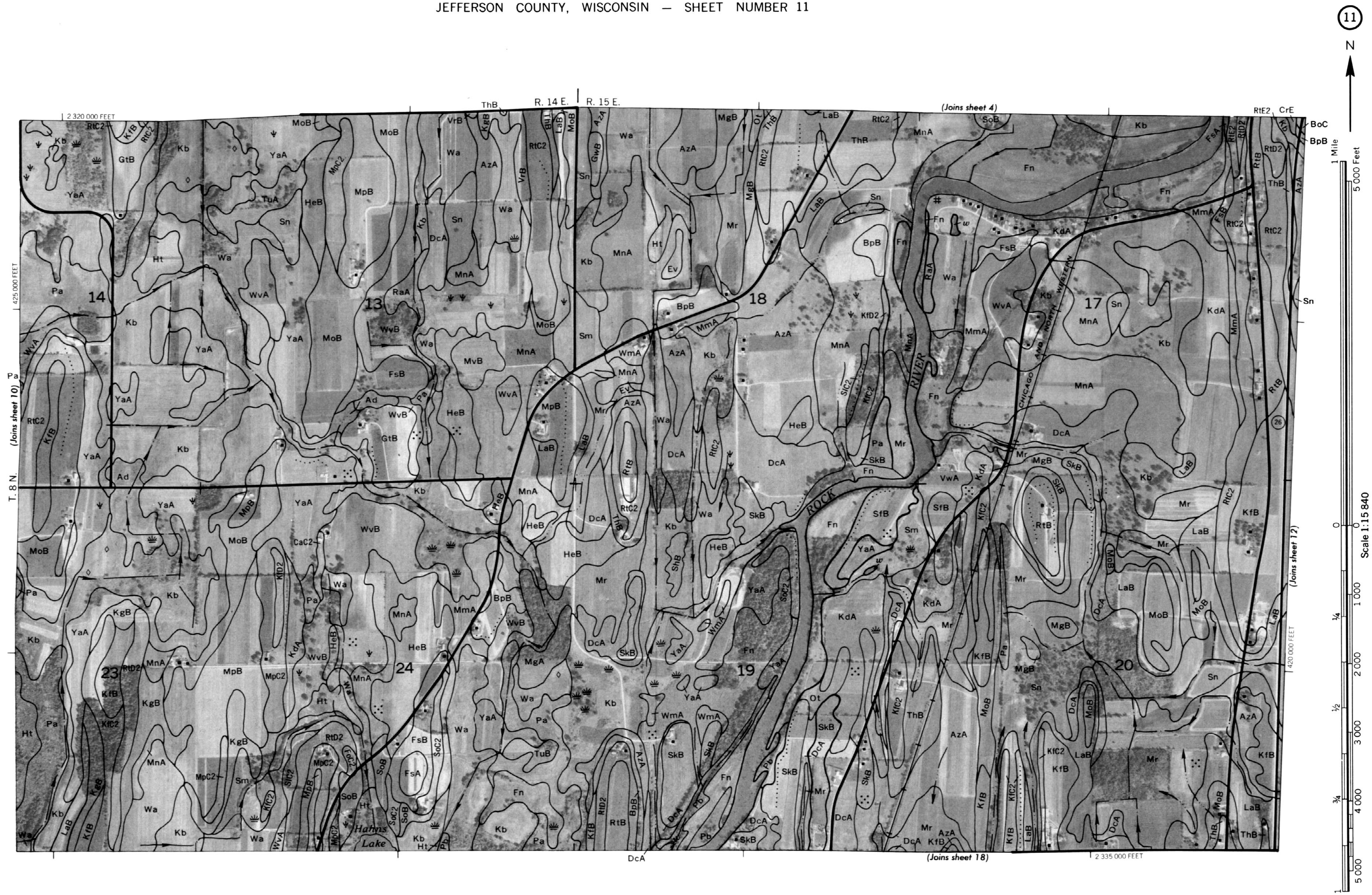
JEFFERSON COUNTY, WISCONSIN NO. 10



JEFFERSON COUNTY, WISCONSIN NO. 11

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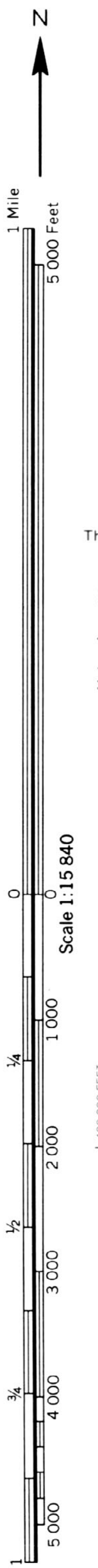
JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 12



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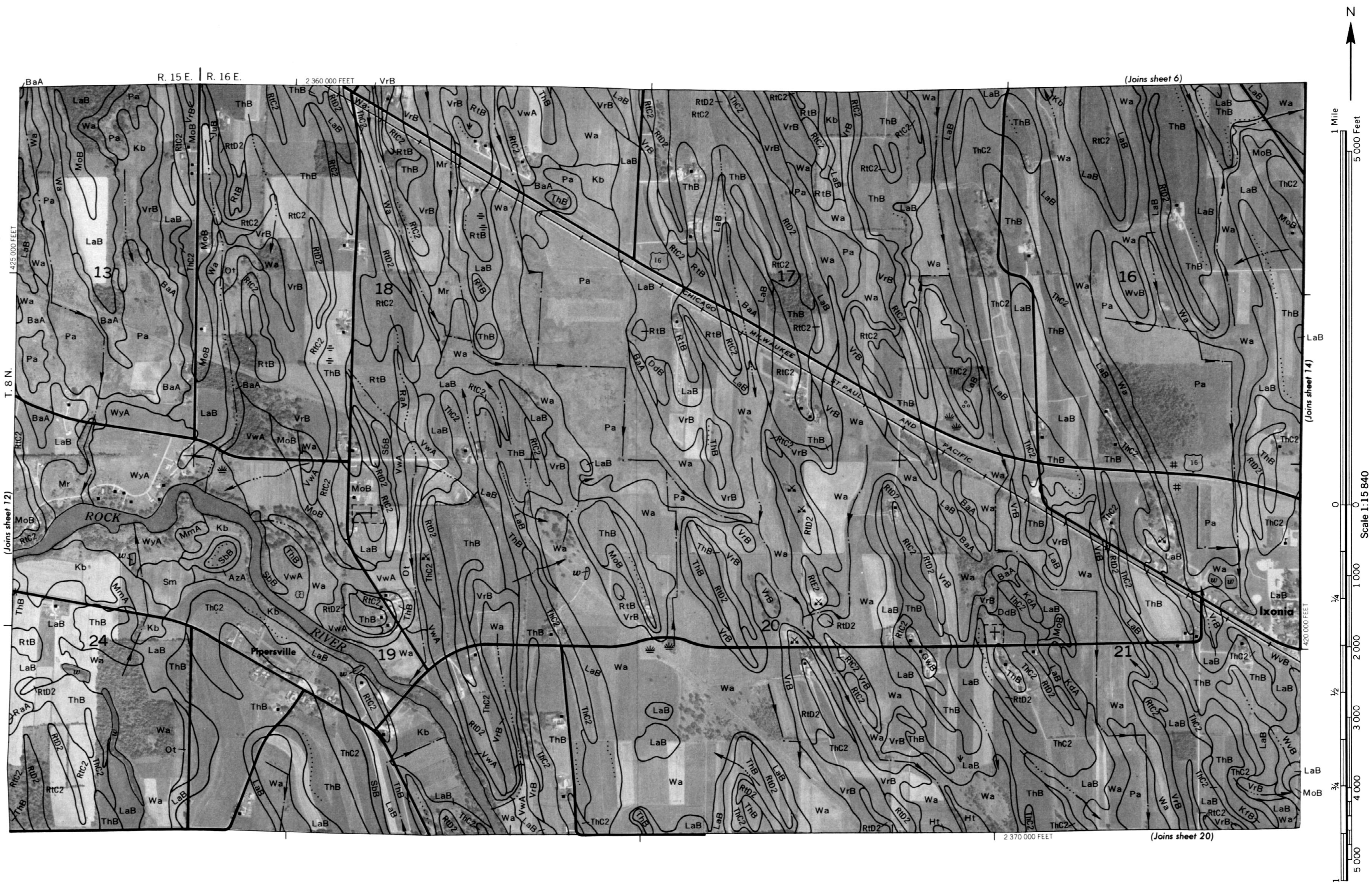
JEFFERSON COUNTY, WISCONSIN NO. 12



JEFFERSON COUNTY, WISCONSIN, NO. 13

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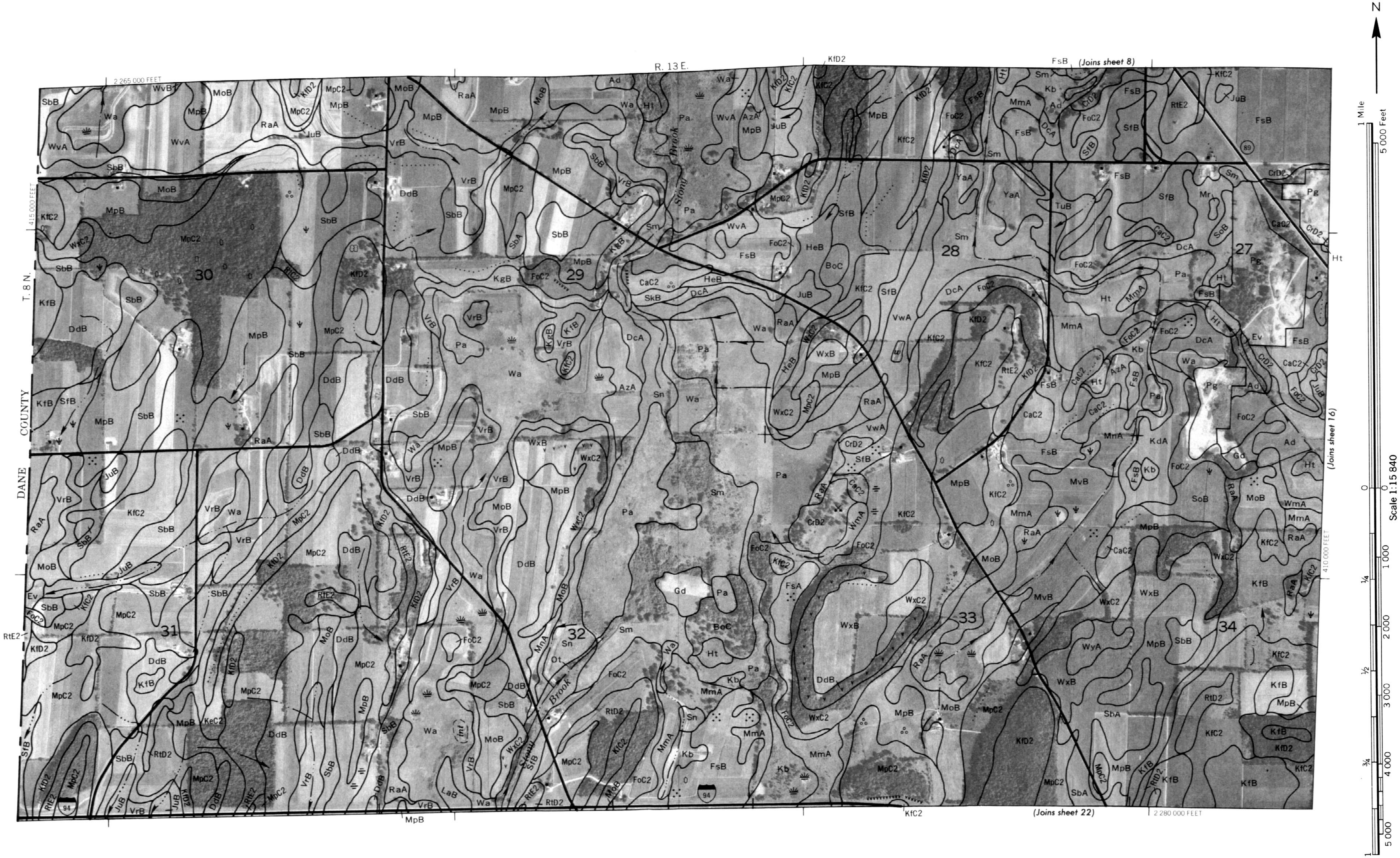
JEFFERSON COUNTY, WISCONSIN NO. 14



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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 16

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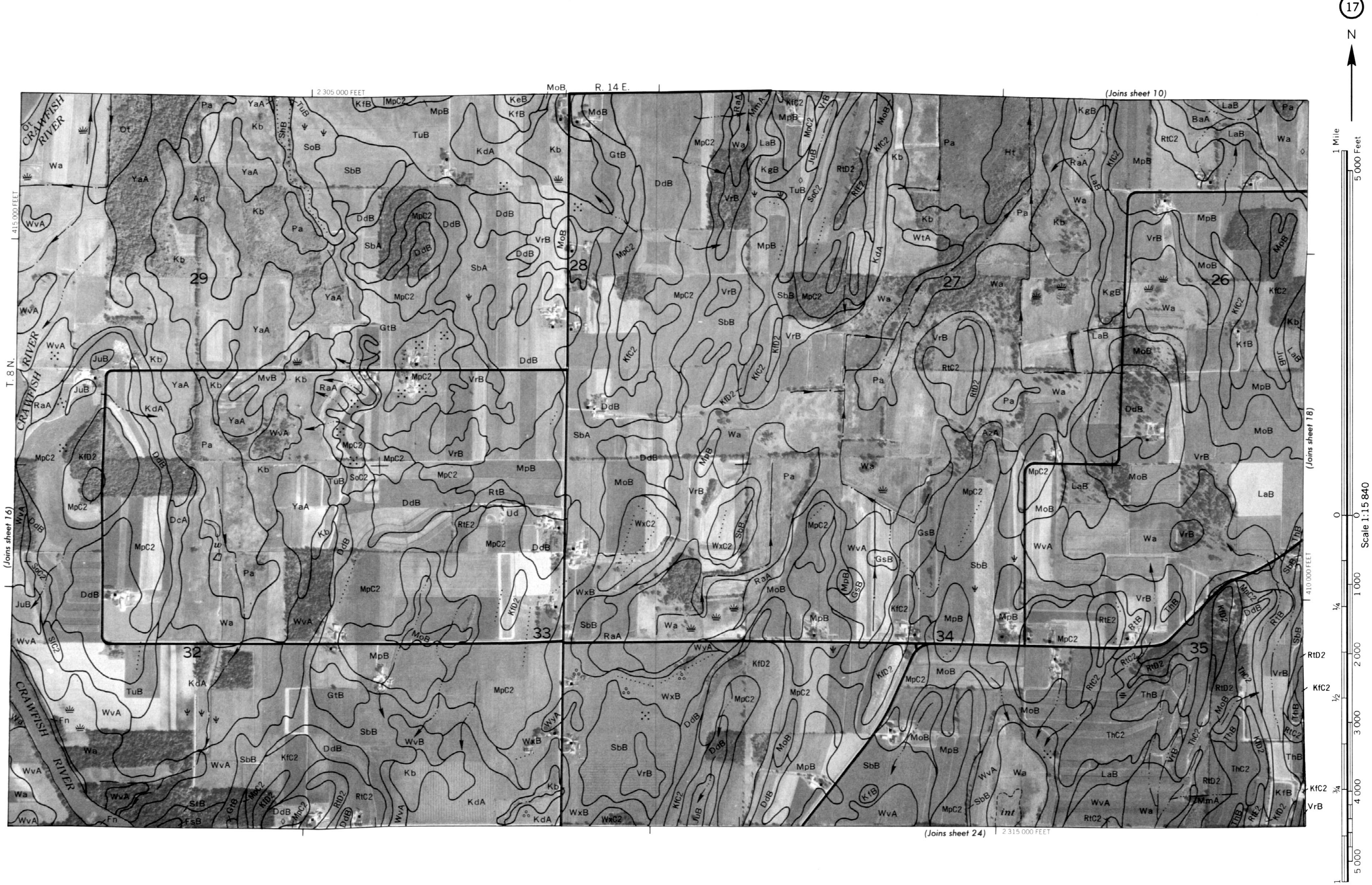
JEFFERSON COUNTY, WISCONSIN NO. 16



JEFFERSON COUNTY, WISCONSIN NO. 17

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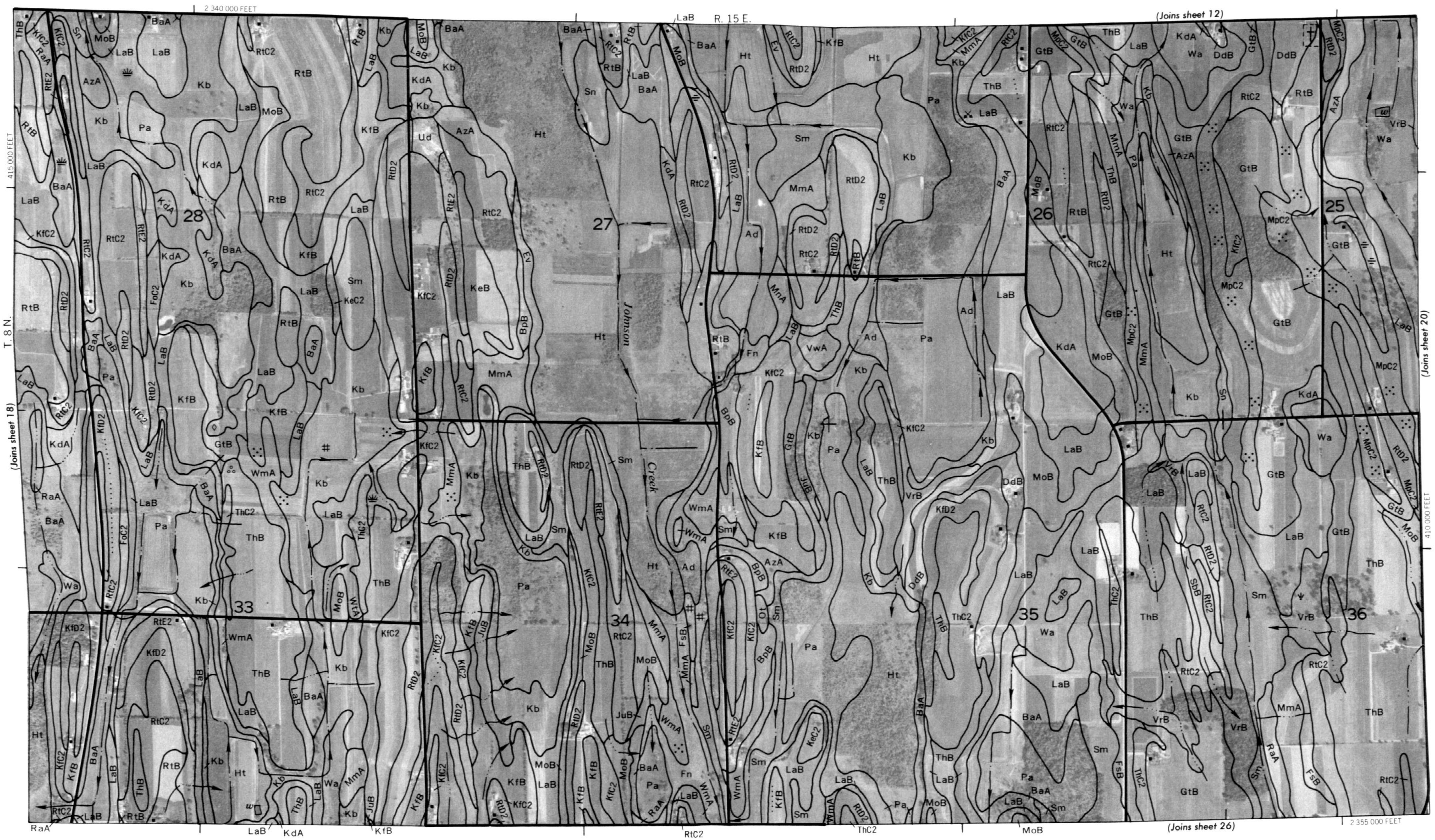
19

N



1 Mile
5 000 Feet
0
¼
½
¾
1
0
1 000
2 000
3 000
4 000
5 000
Scale 1:15 840

JEFFERSON COUNTY, WISCONSIN NO. 19

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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 2

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JEFFERSON COUNTY, WISCONSIN NO. 2

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 20

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JEFFERSON COUNTY, WISCONSIN NO. 21

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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 22

N

Scale 1:15 840

1 Mile — 5 000 Feet

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JEFFERSON COUNTY, WISCONSIN NO. 22

JEFFERSON COUNTY, WISCONSIN NO. 23

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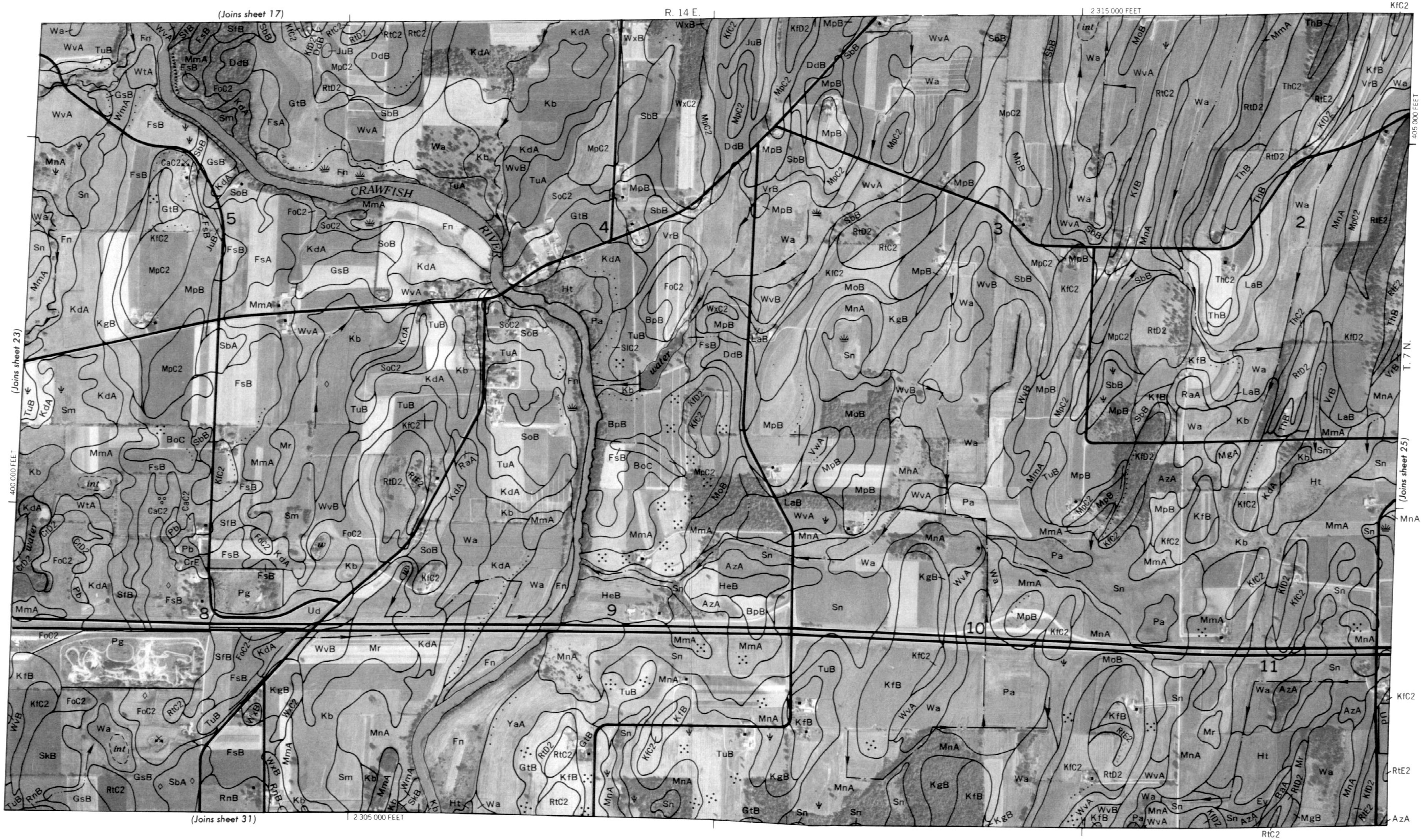
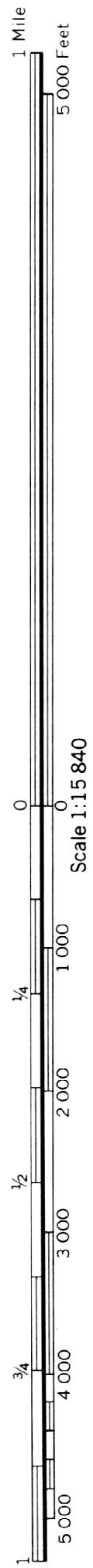
JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 24

N





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JEFFERSON COUNTY, WISCONSIN NO. 24

JEFFERSON COUNTY, WISCONSIN NO. 25

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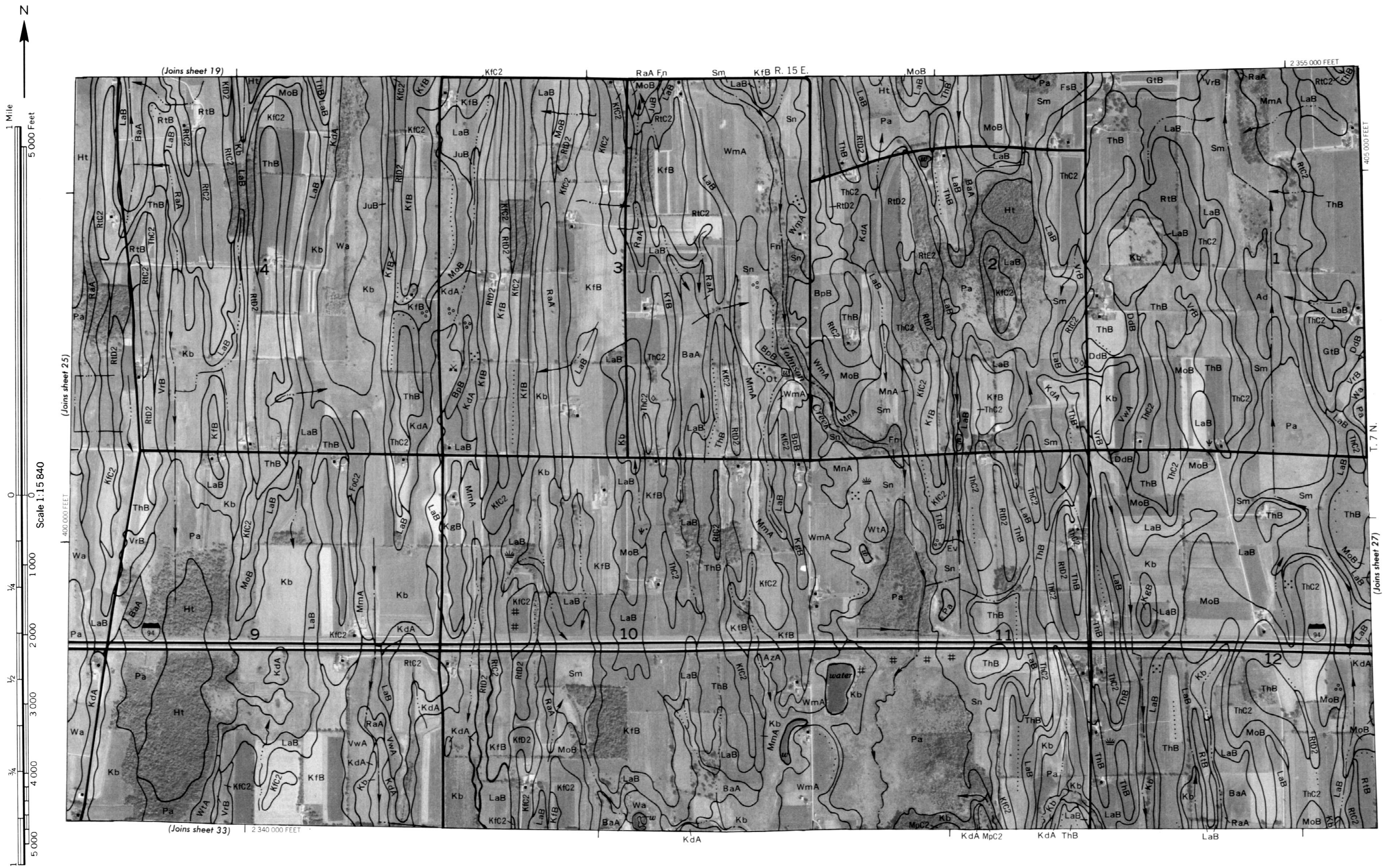

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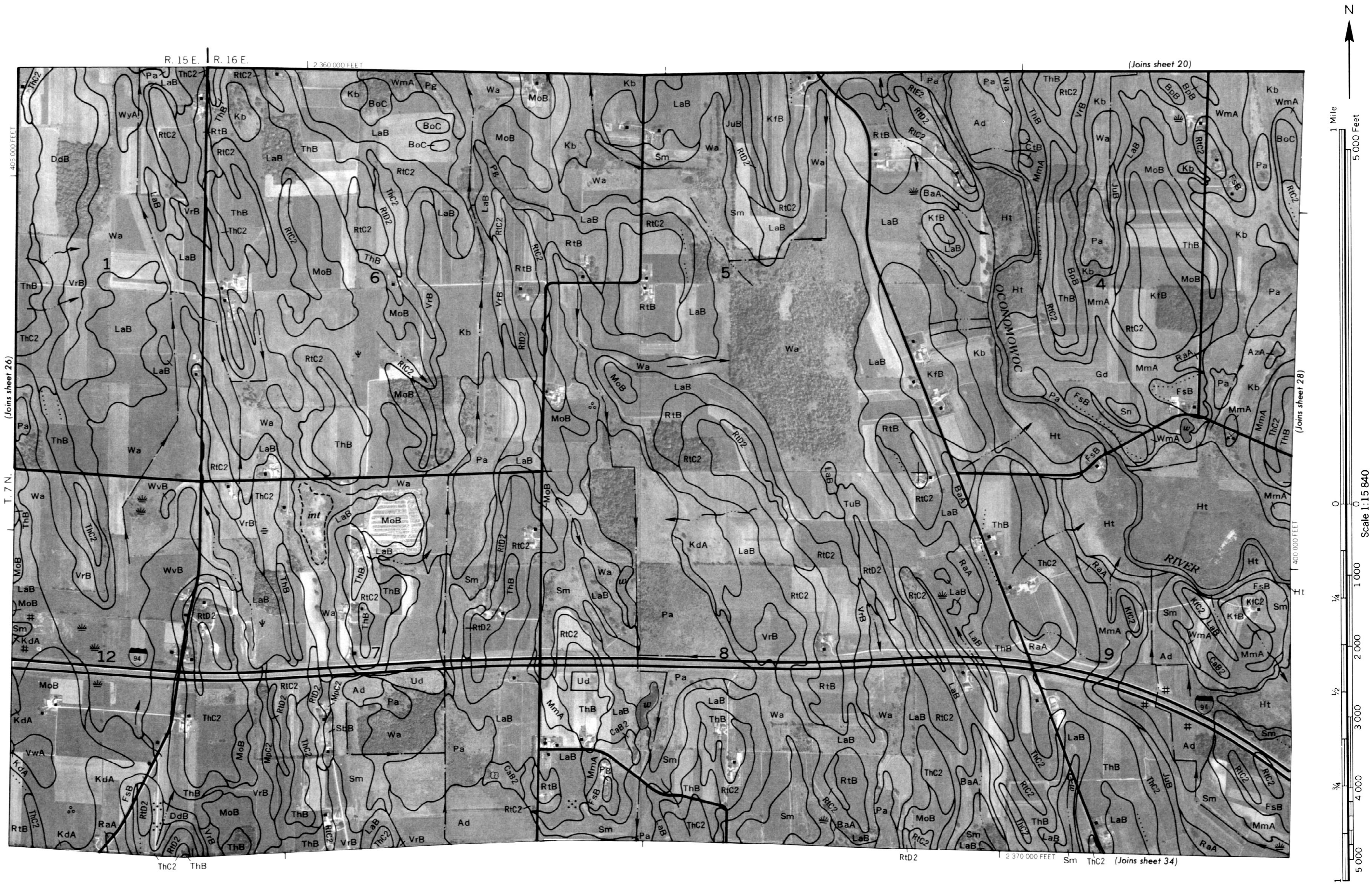

JEFFERSON COUNTY, WISCONSIN NO. 27

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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 28

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JEFFERSON COUNTY, WISCONSIN NO. 28

N

Scale 1:15 840

1 Mile — 0 — ¼ — ½ — ¾ — 1

5 000 Feet — 0 — 1 000 — 2 000 — 3 000 — 4 000 — 5 000

JEFFERSON COUNTY, WISCONSIN NO. 29

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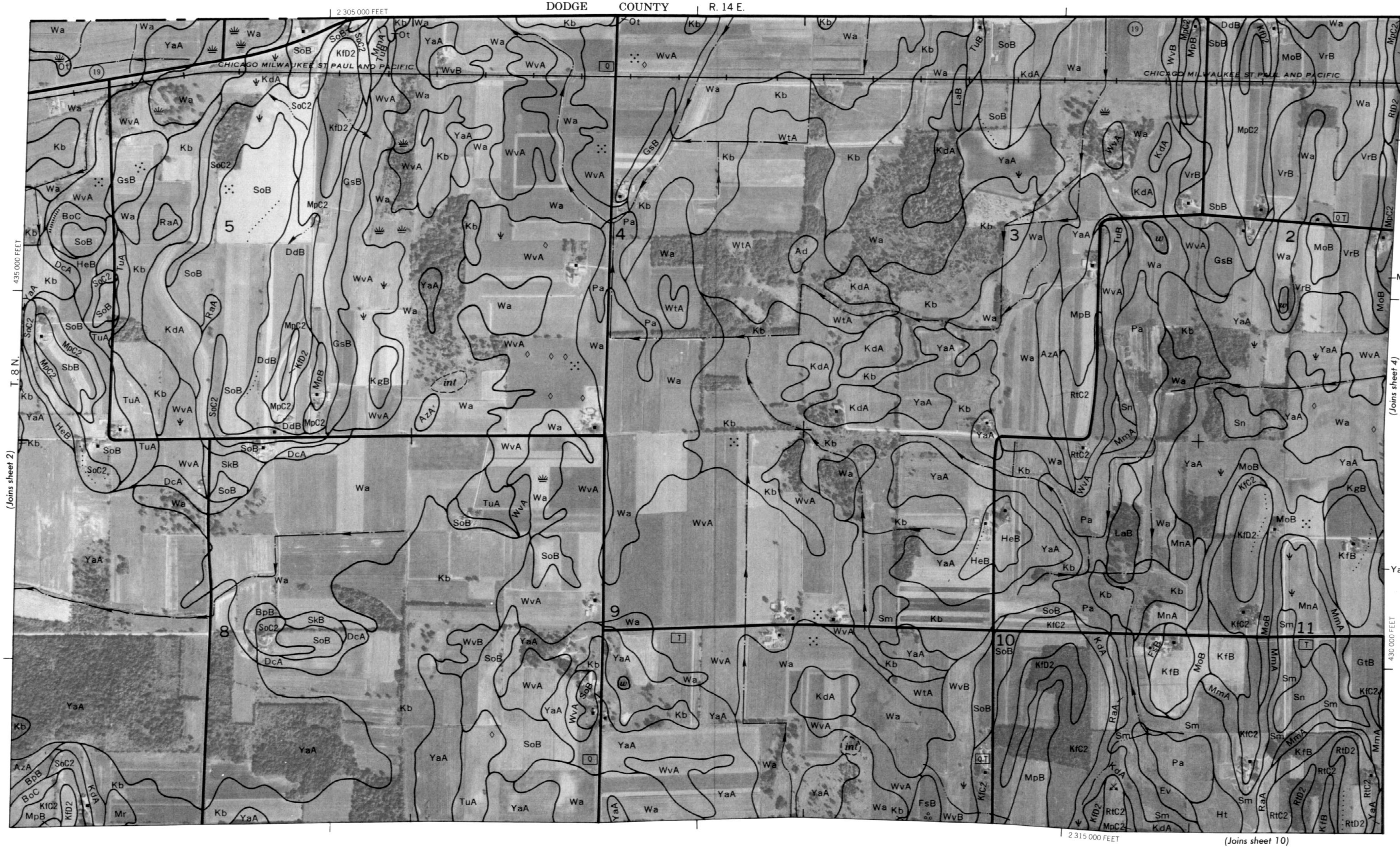
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

3

N



1 Mile
5 000 Feet
Scale 1:15 840

JEFFERSON COUNTY, WISCONSIN NO. 3

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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 30

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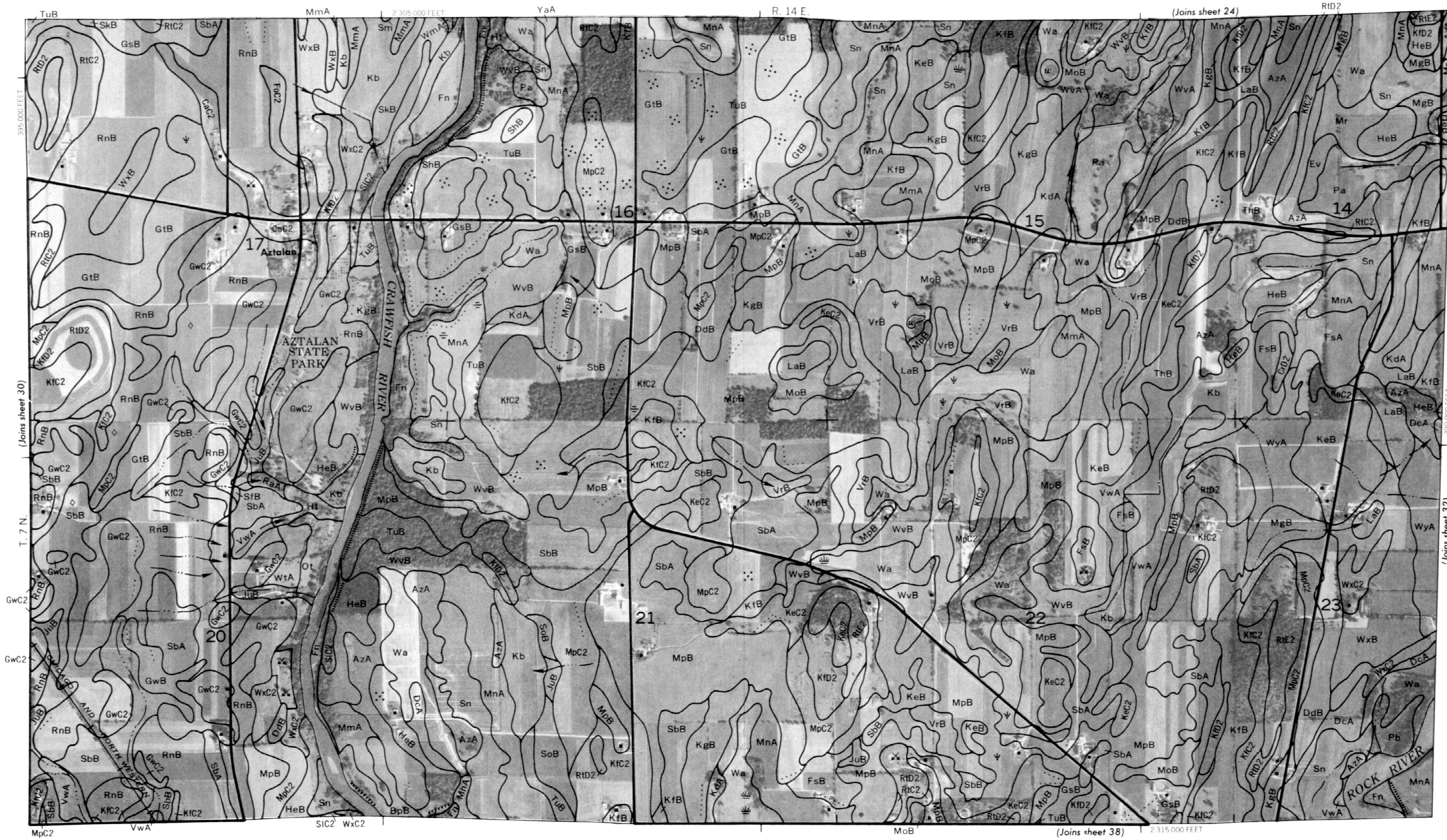
31

N



1 Mile
5 000 Feet
0
1/4
1/2
3/4
1
0
1 000
2 000
3 000
4 000
5 000
Scale 1:15 840

JEFFERSON COUNTY, WISCONSIN NO. 31

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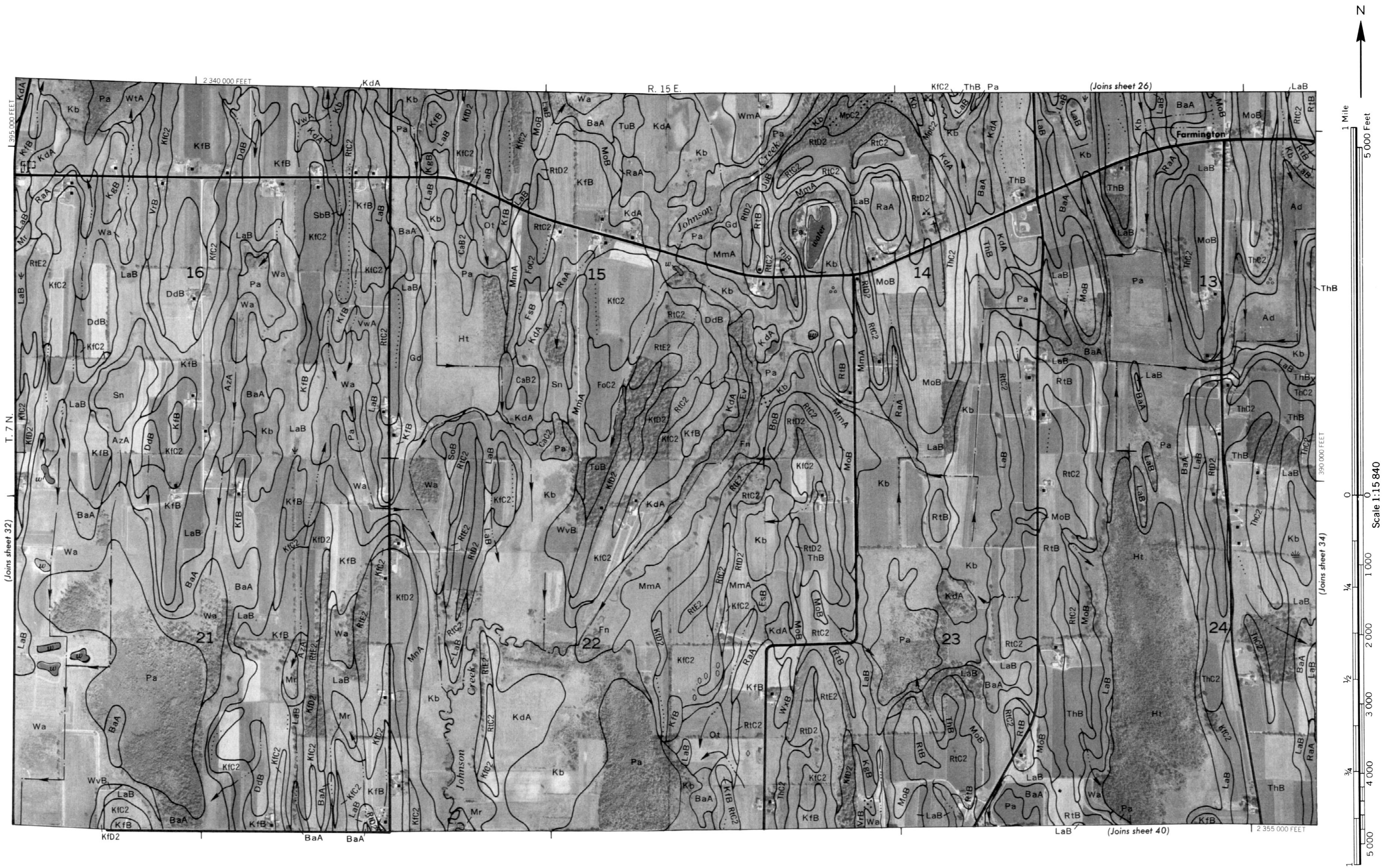
JEFFERSON COUNTY, WISCONSIN NO. 32

33



JEFFERSON COUNTY, WISCONSIN NO. 33

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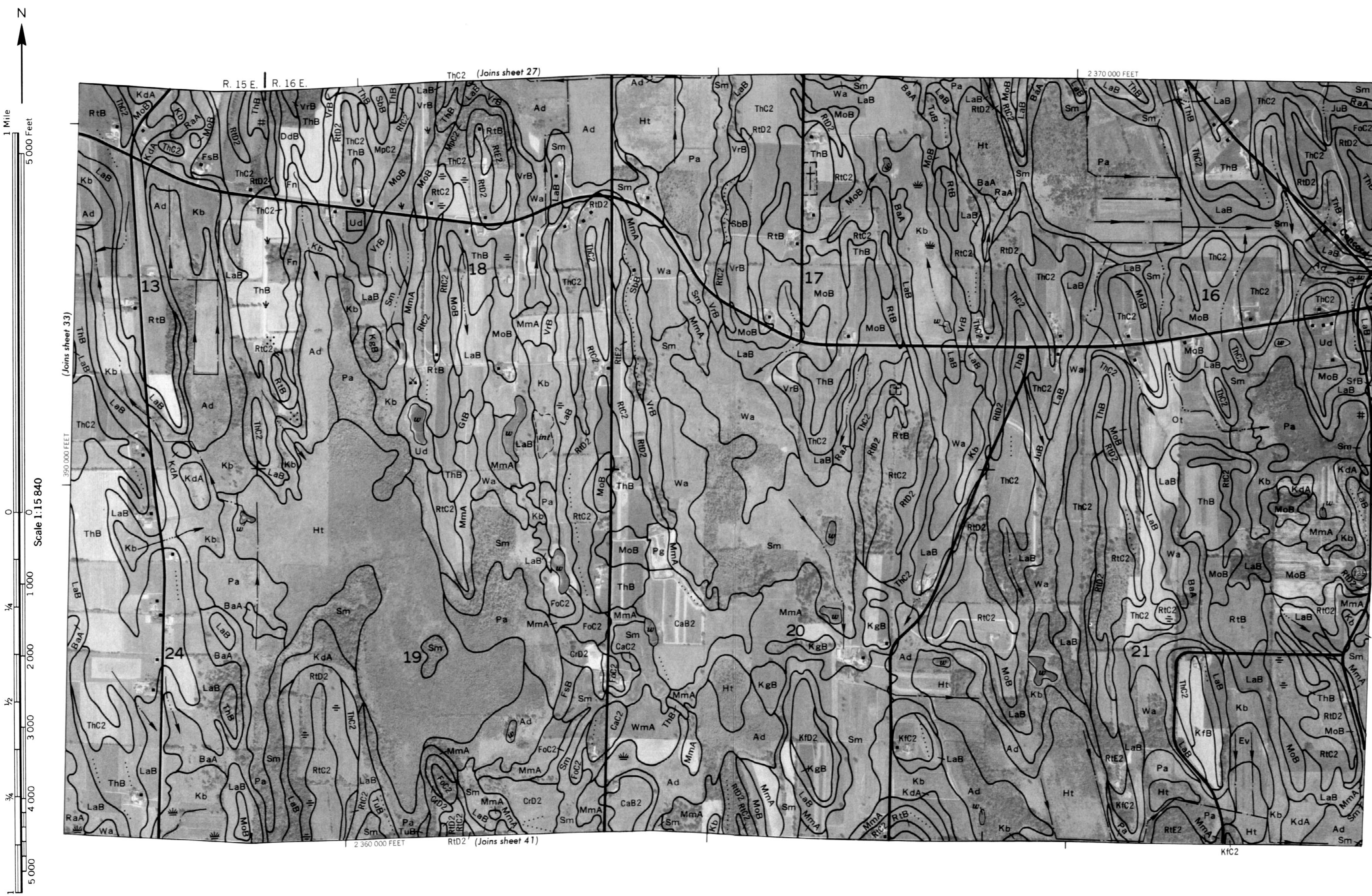

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35

JEFFERSON COUNTY, WISCONSIN NO. 35

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JEFFERSON COUNTY, WISCONSIN NO. 37

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JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 38

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JEFFERSON COUNTY, WISCONSIN NO. 38

JEFFERSON COUNTY, WISCONSIN NO. 39

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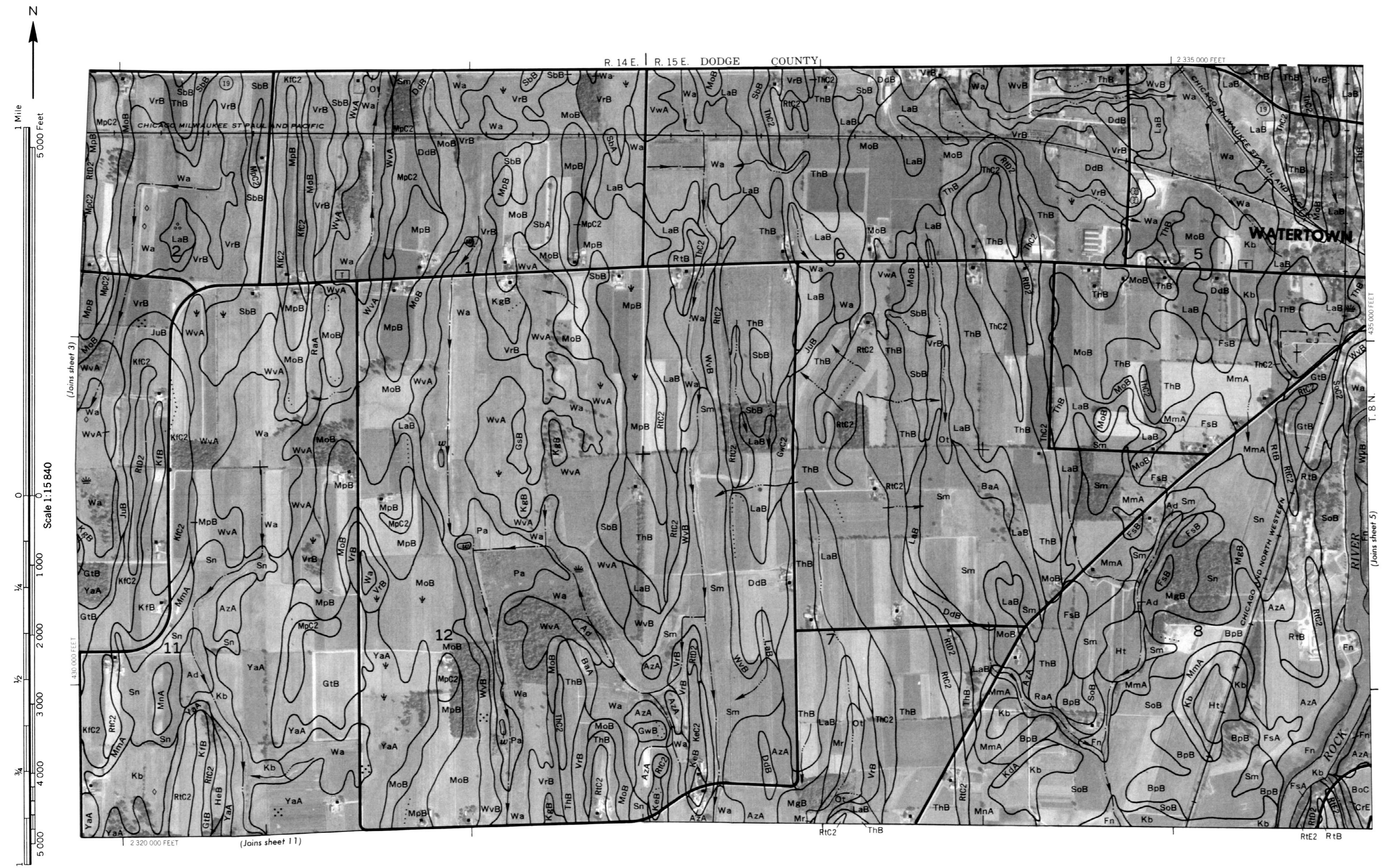
4

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 4



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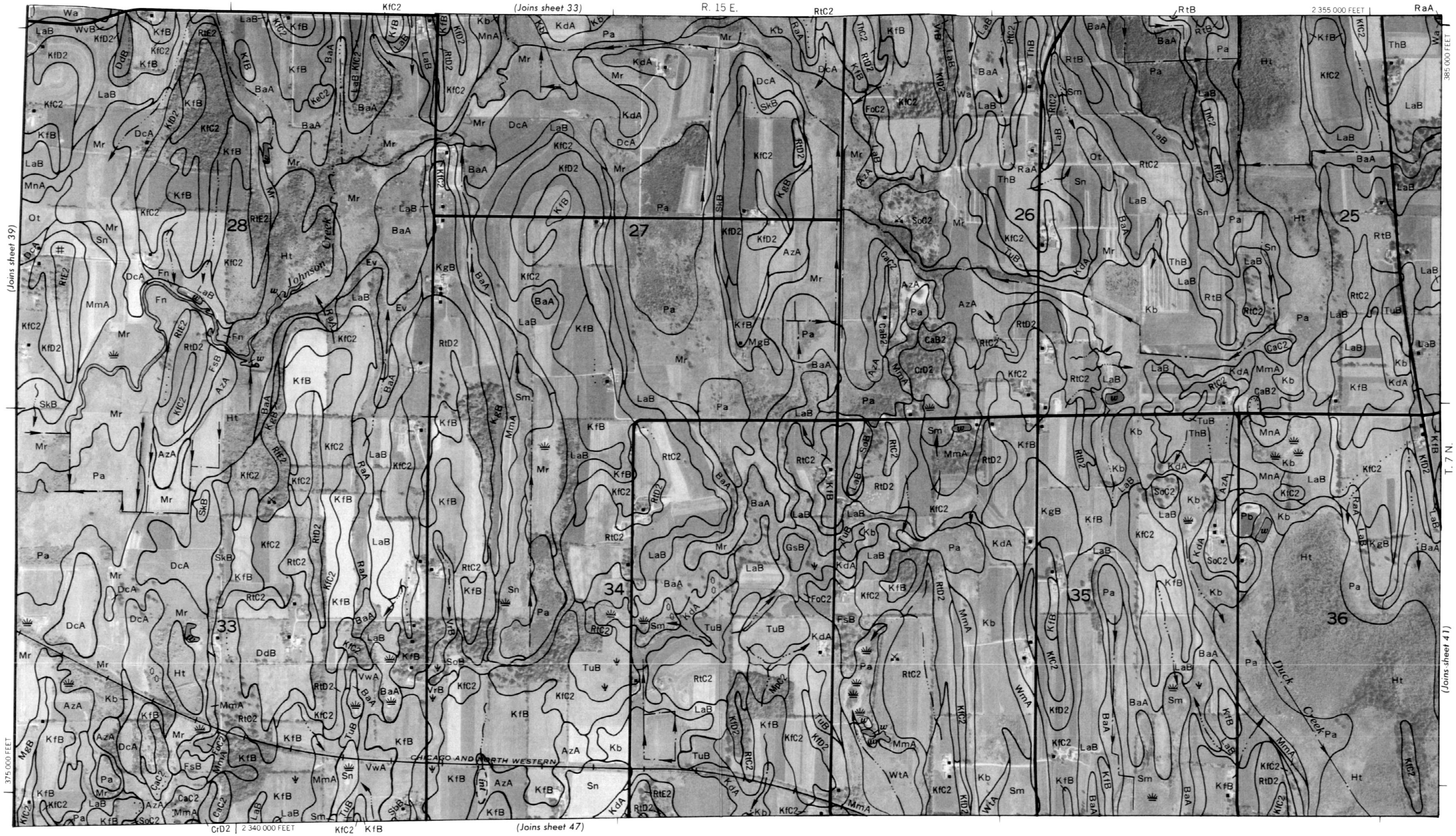
JEFFERSON COUNTY, WISCONSIN NO. 4

40

N



Scale 1:15 840

1 Mile — 5 000 Feet

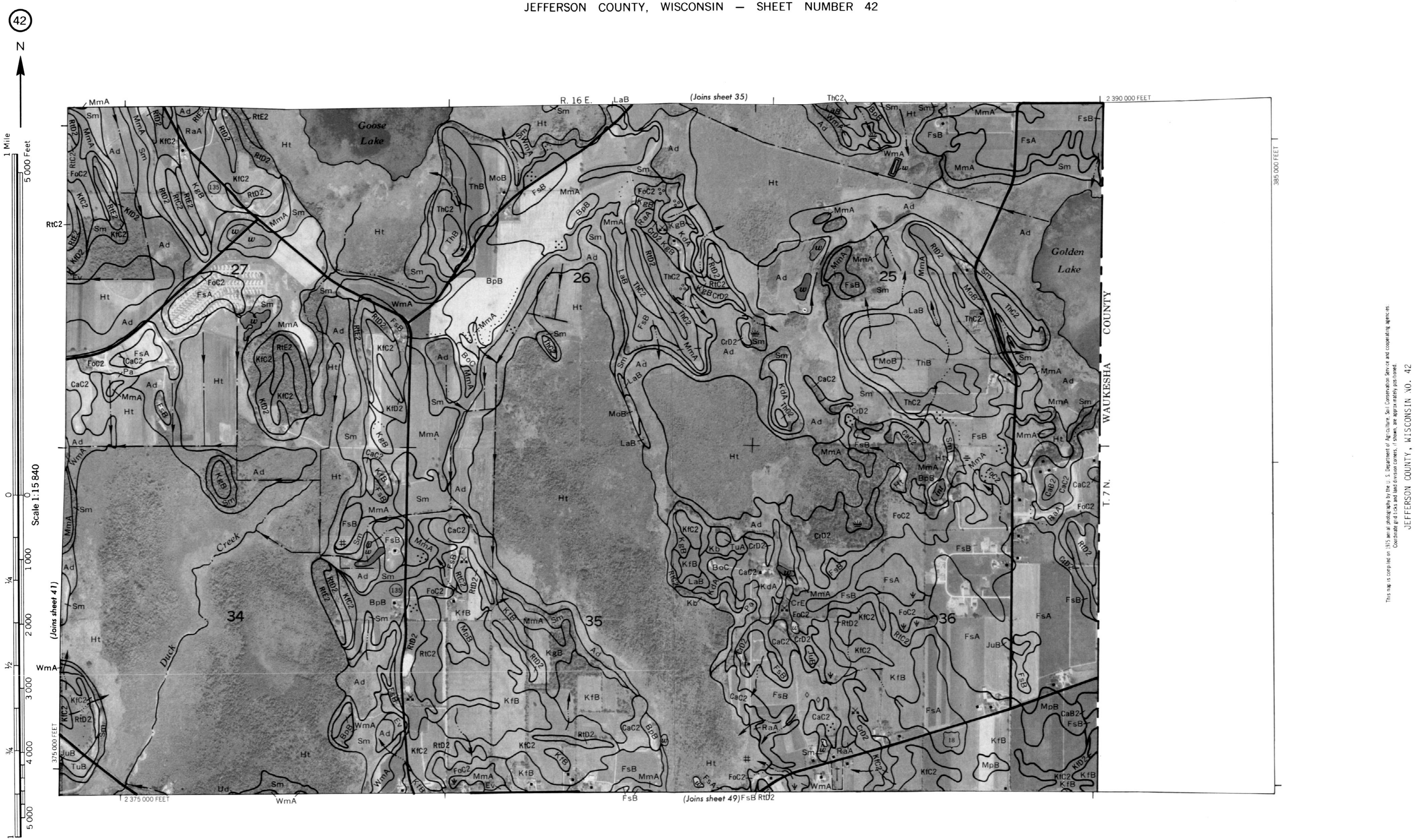
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 40

41

JEFFERSON COUNTY, WISCONSIN NO. 41

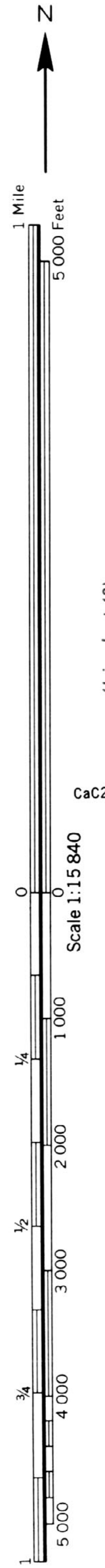
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

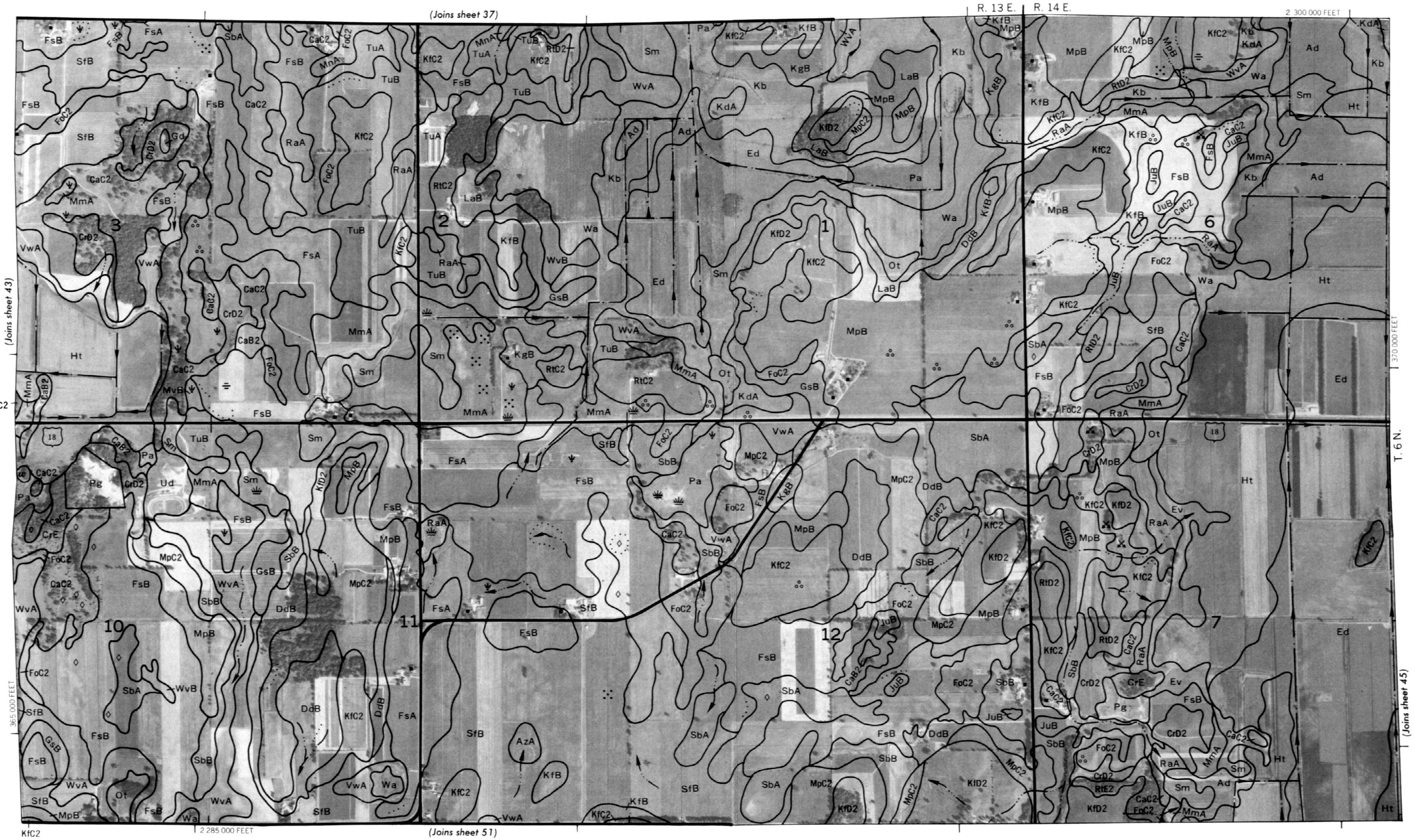

42
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 35)
(Joins sheet 41)
(Joins sheet 49)
R. 16 E.
T. 7 N.
WAUKESHA COUNTY
Goose Lake
Golden Lake
Duck Creek
27
26
25
34
35
36
2 390 000 FEET
385 000 FEET
2 375 000 FEET
375 000 FEET
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
JEFFERSON COUNTY, WISCONSIN NO. 42

JEFFERSON COUNTY, WISCONSIN NO. 43

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 44





This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 45

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 Mile
5 000 Feet
Scale 1:15 840

JEFFERSON COUNTY, WISCONSIN NO. 47

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

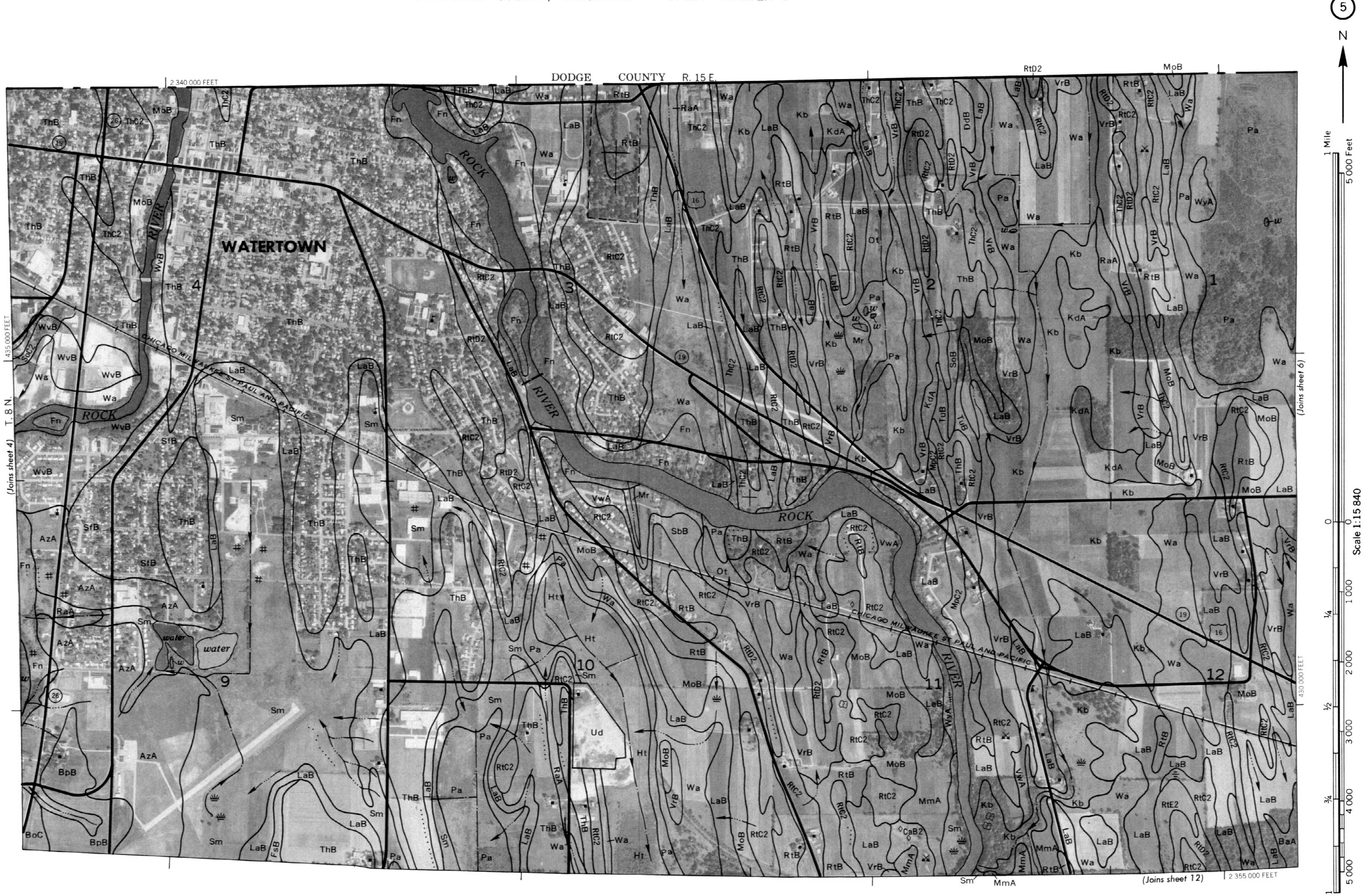
JEFFERSON COUNTY, WISCONSIN NO. 48

49

JEFFERSON COUNTY, WISCONSIN NO. 49

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 5

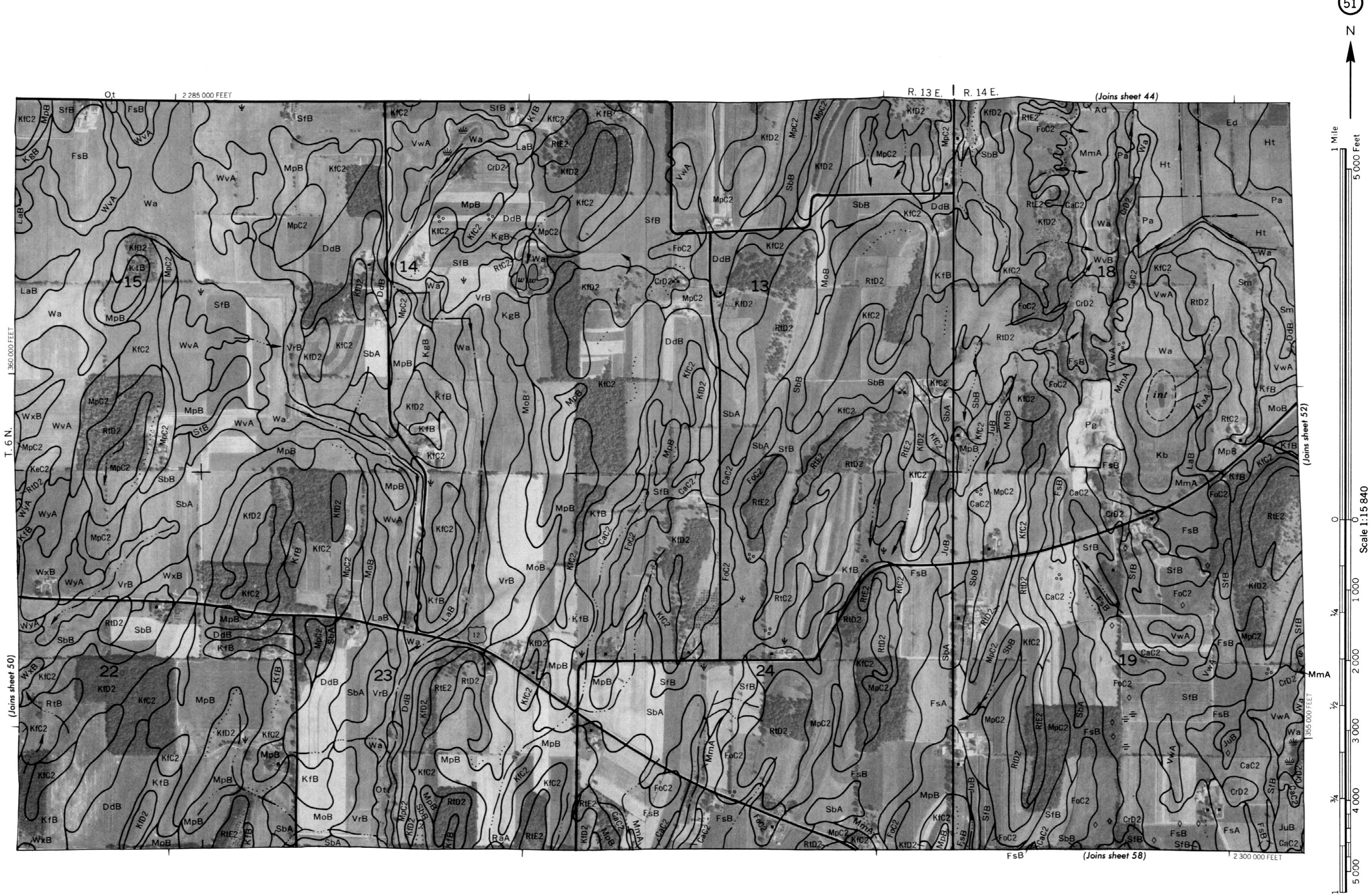


JEFFERSON COUNTY, WISCONSIN NO. 5

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

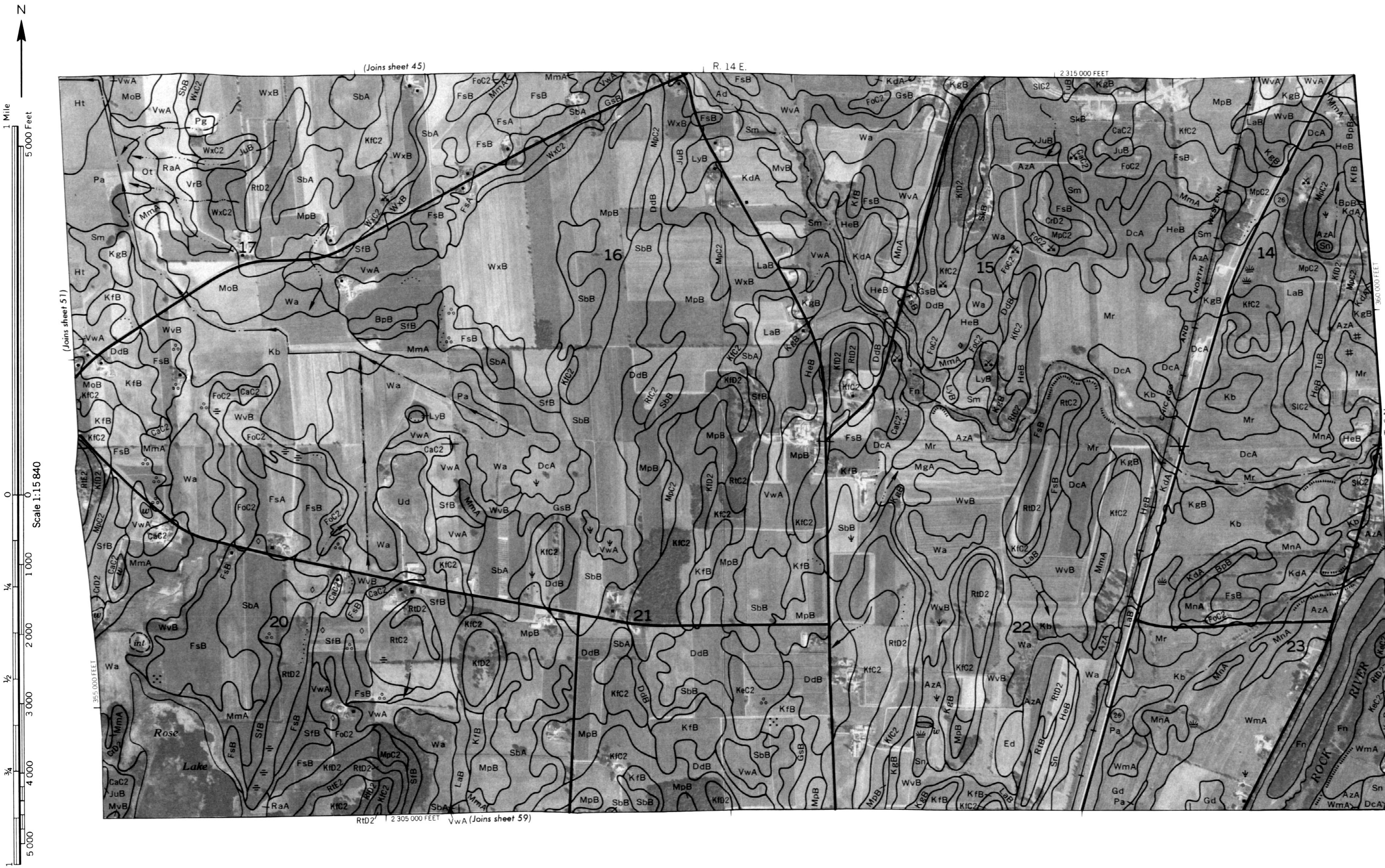
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 50

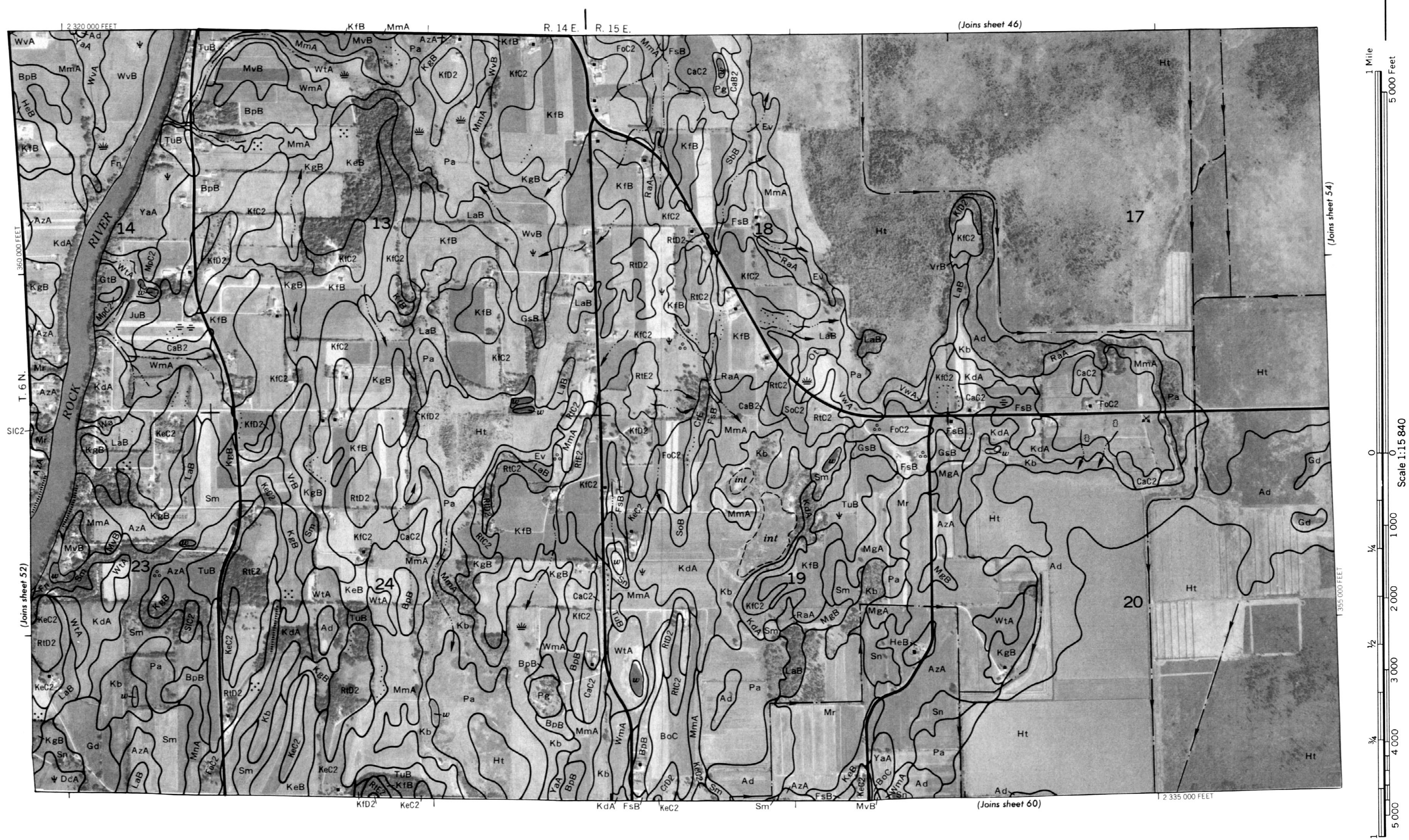


JEFFERSON COUNTY, WISCONSIN NO. 51

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division c rs, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

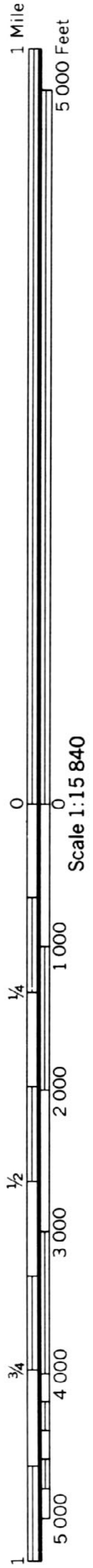


JEFFERSON COUNTY, WISCONSIN NO. 53

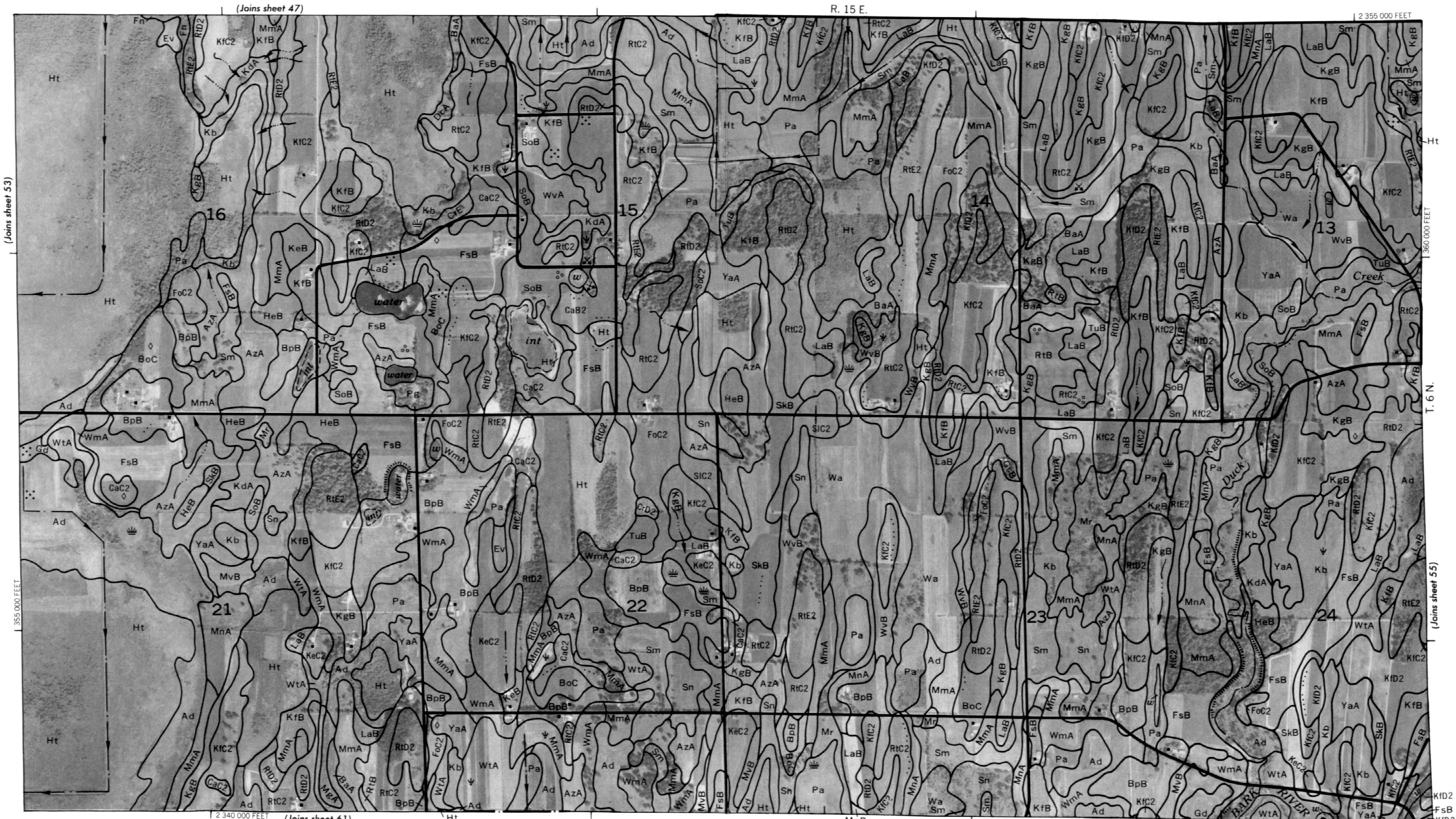
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 54

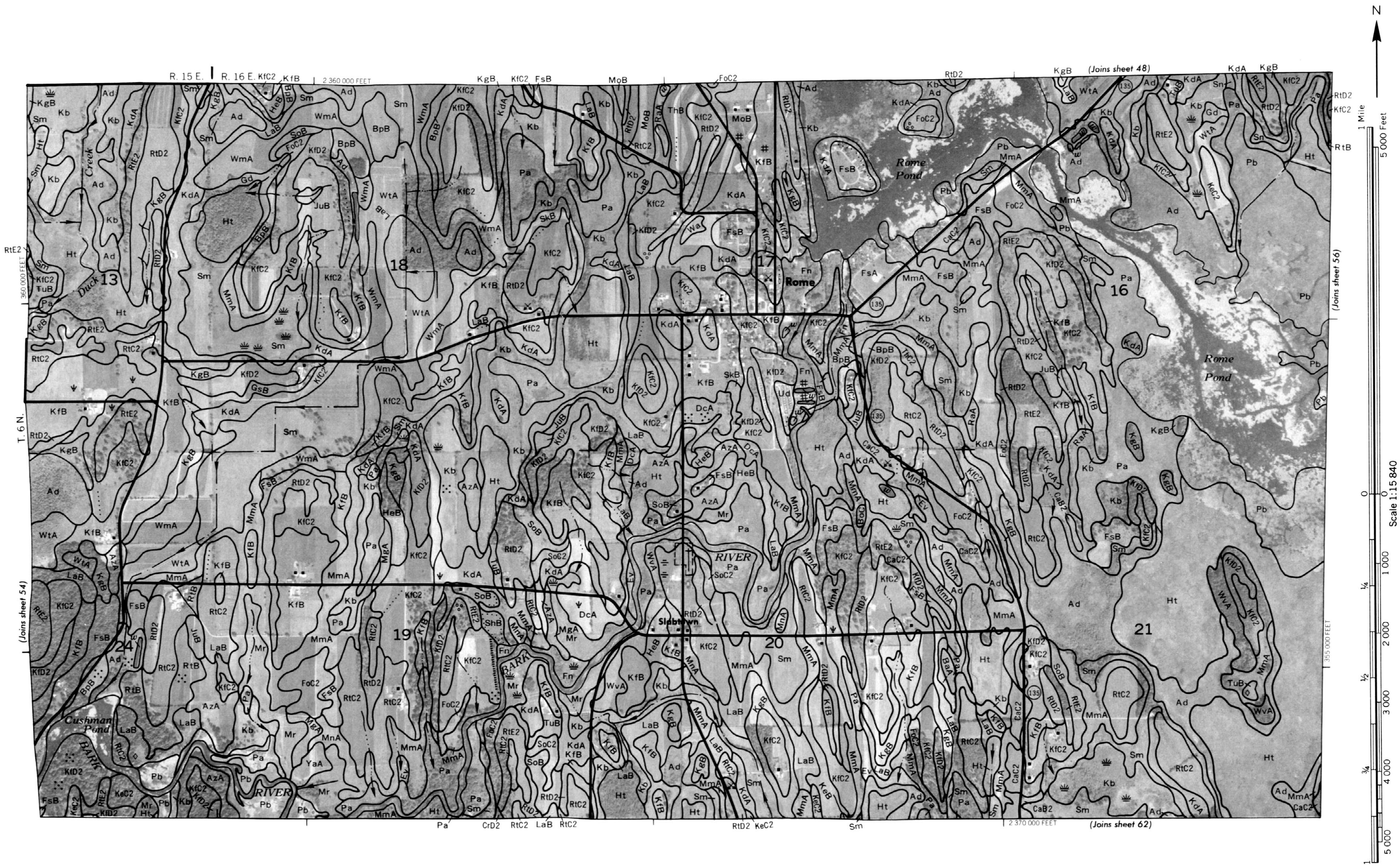
N



Scale 1:15 840



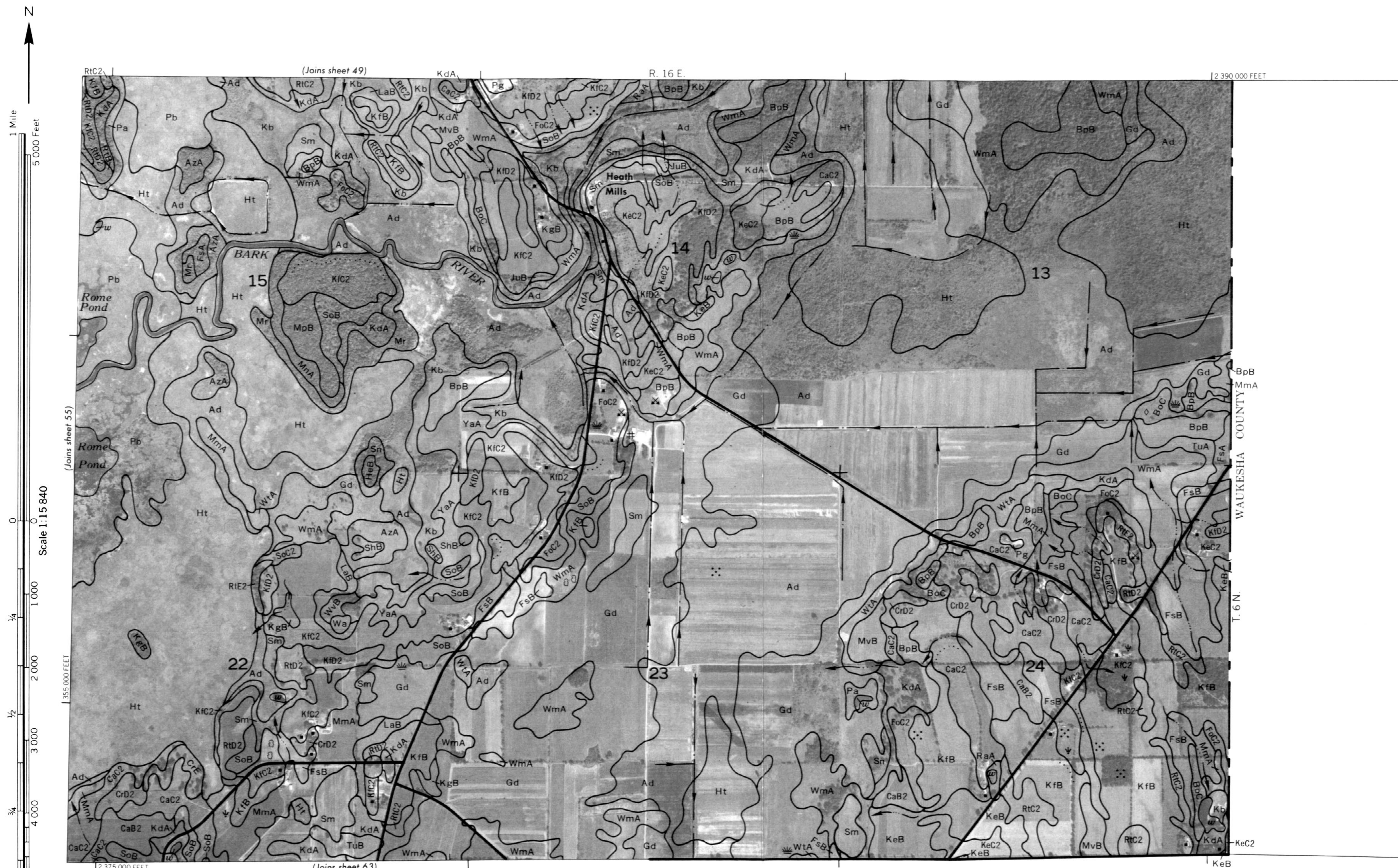
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



JEFFERSON COUNTY, WISCONSIN NO. 55

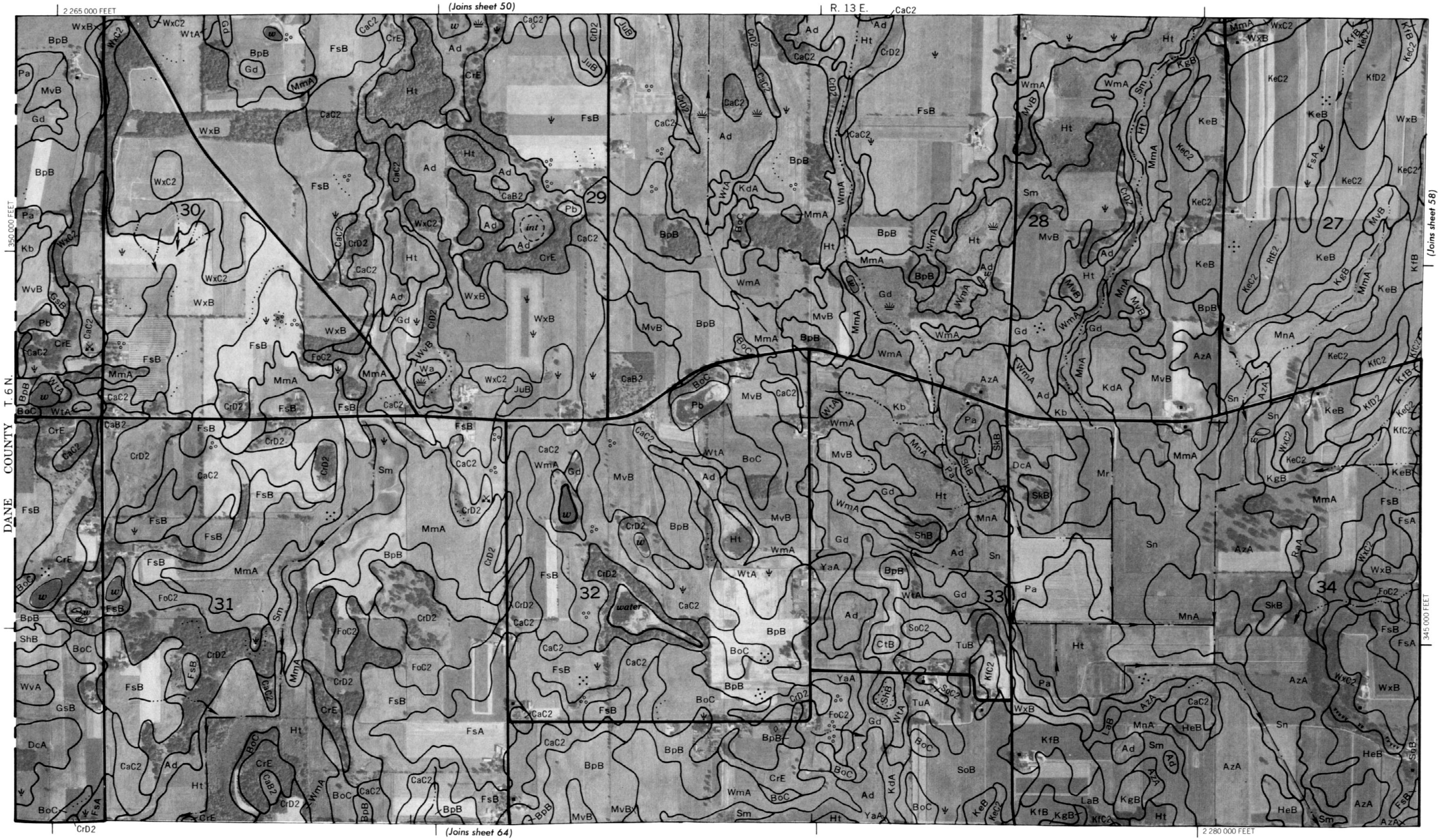
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

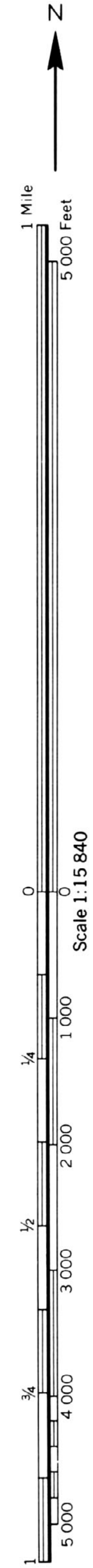
JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 56



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

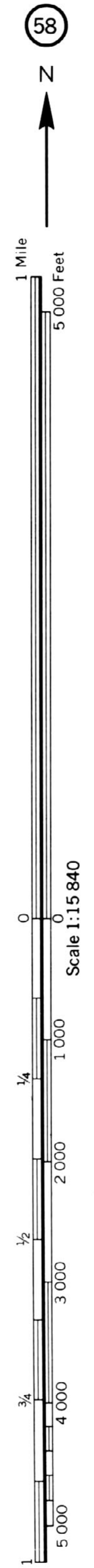
57





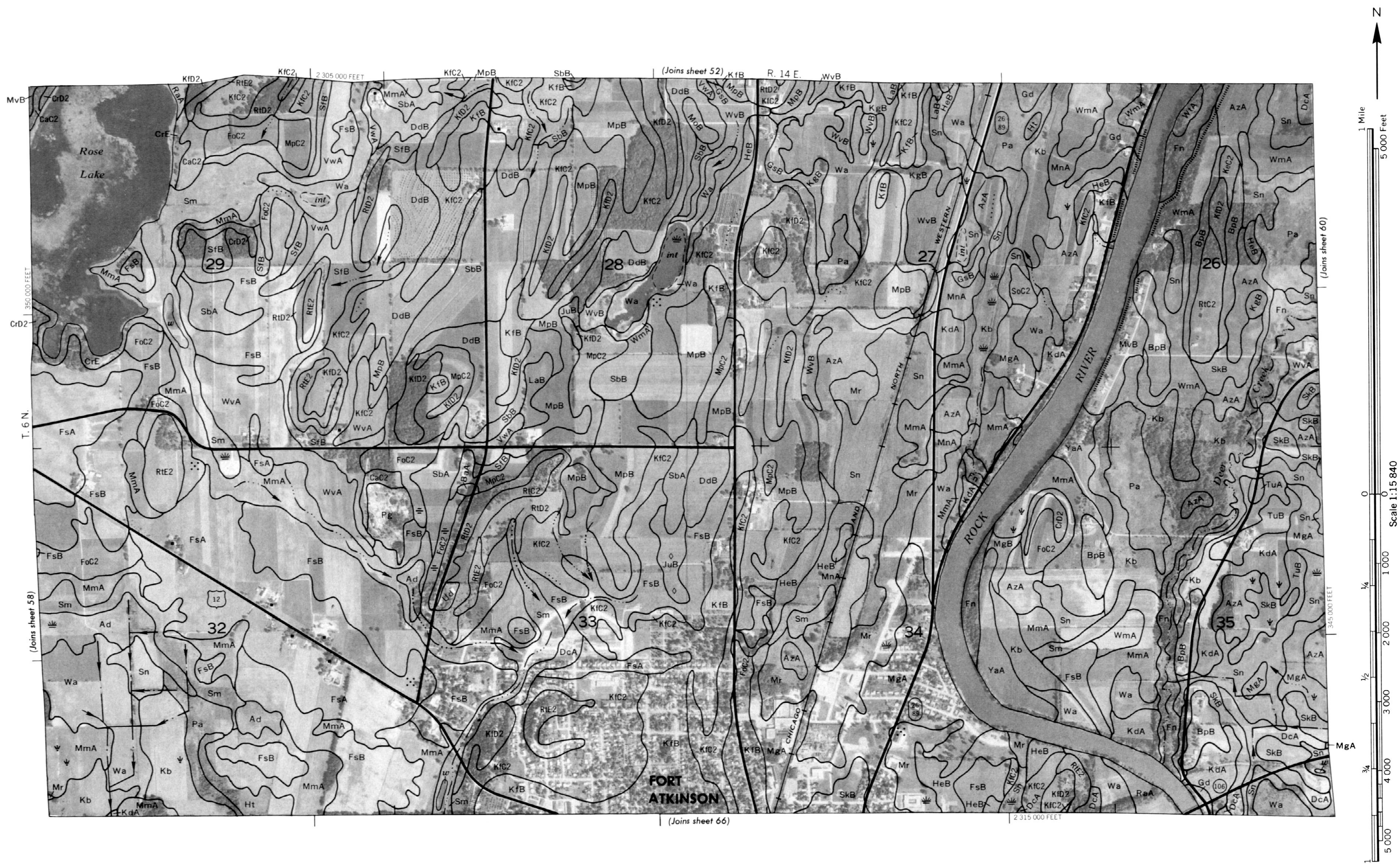
JEFFERSON COUNTY, WISCONSIN NO. 57

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

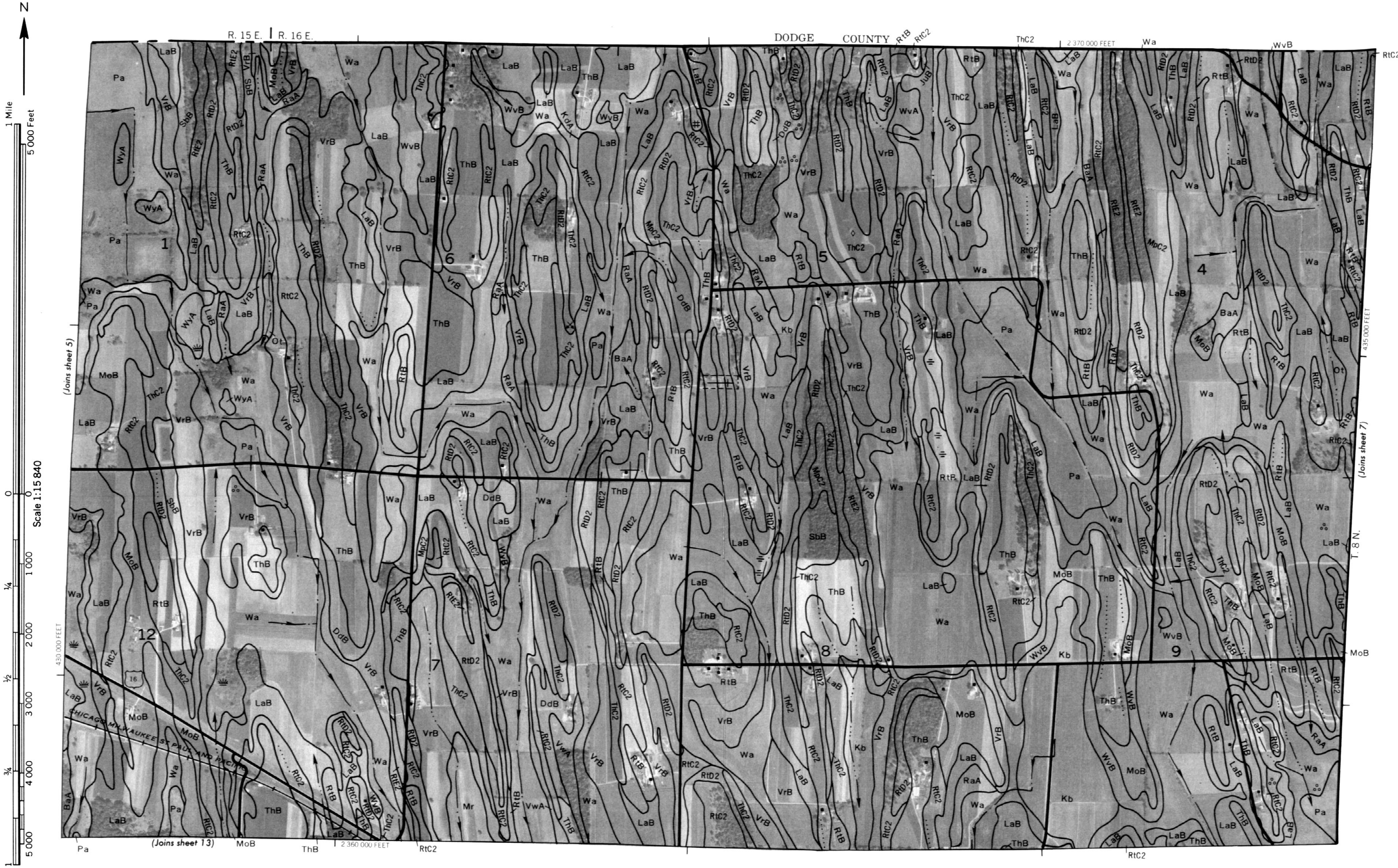
JEFFERSON COUNTY, WISCONSIN NO. 58



JEFFERSON COUNTY, WISCONSIN NO. 59

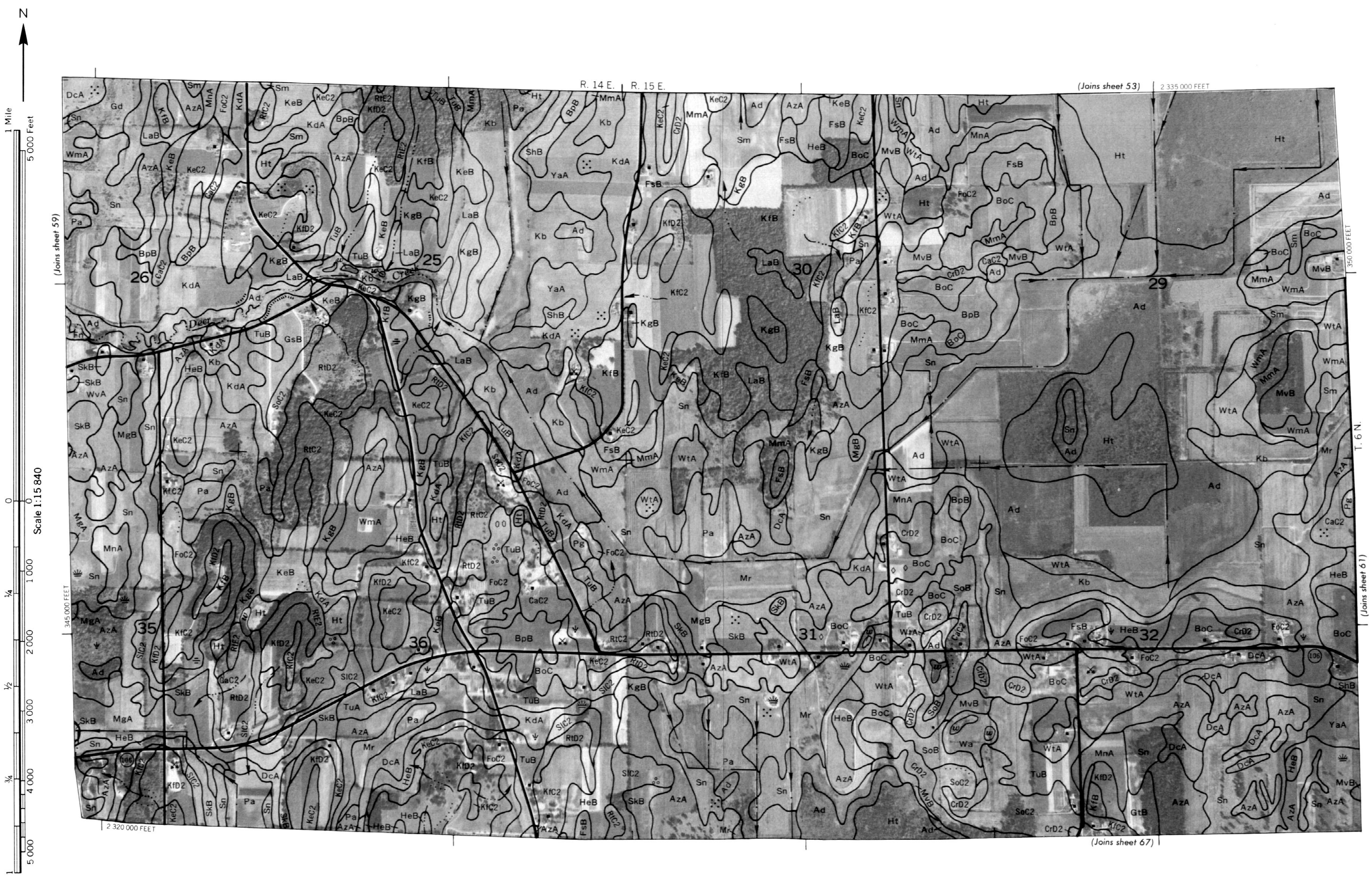
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 6



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 6



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

61

N

1 Mile
5 000 Feet
Scale 1:15 840
0 0
1 000
¼
2 000
½
3 000
¾
4 000
1 5 000

JEFFERSON COUNTY, WISCONSIN NO. 61

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

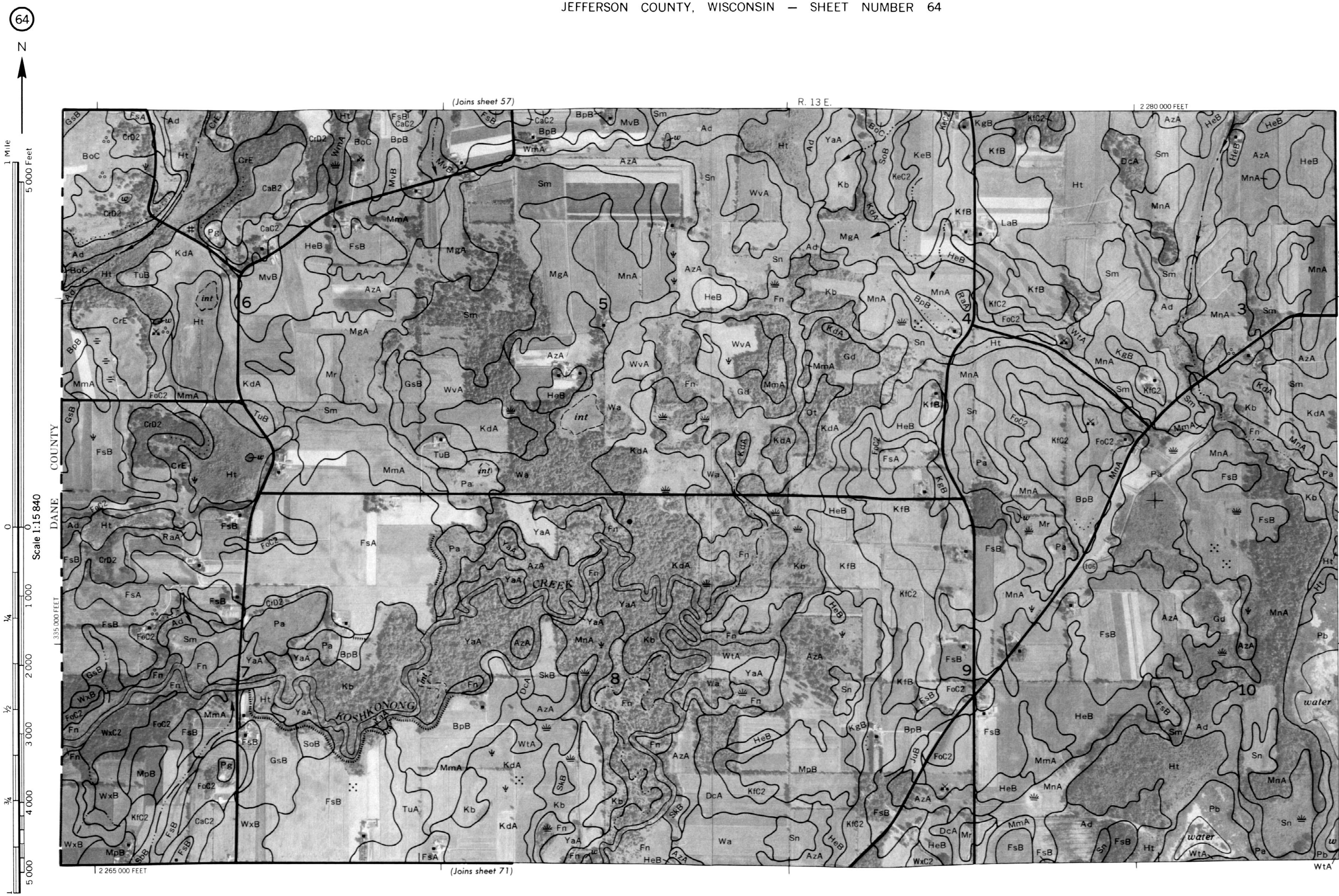
62

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 62

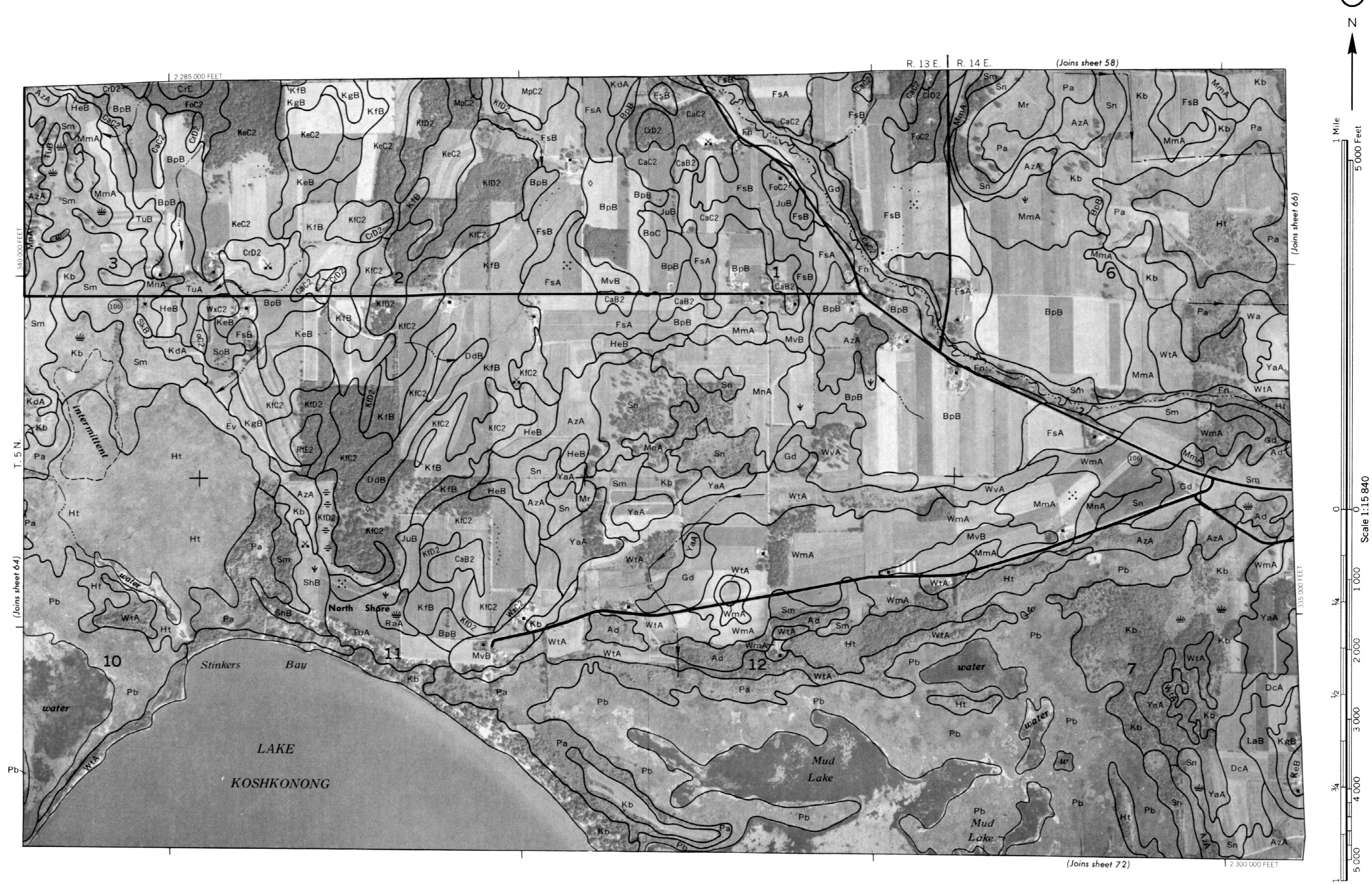
JEFFERSON COUNTY, WISCONSIN NO. 63

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

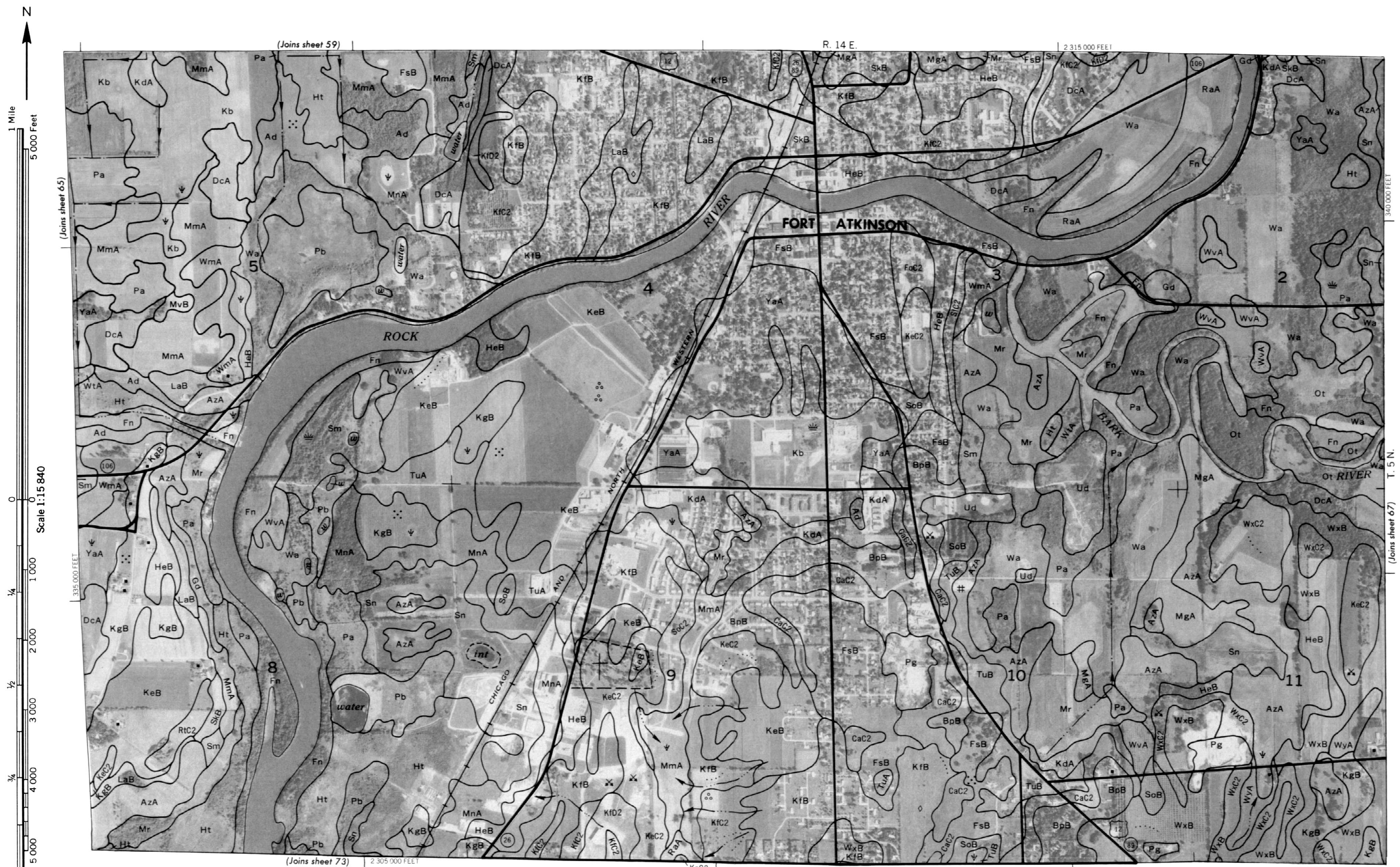


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 64



JEFFERSON COUNTY, WISCONSIN NO. 65
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


67
N
(Joins sheet 60)
R. 14 E.
R. 15 E.
2 320 000 FEET
340 000 FEET
T. 5 N.
(Joins sheet 66)
(Joins sheet 68)
335 000 FEET
(Joins sheet 74)
2 335 000 FEET
BARK
RIVER
River
Whitewater
water
1
2
5
6
7
8
11
12
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

69

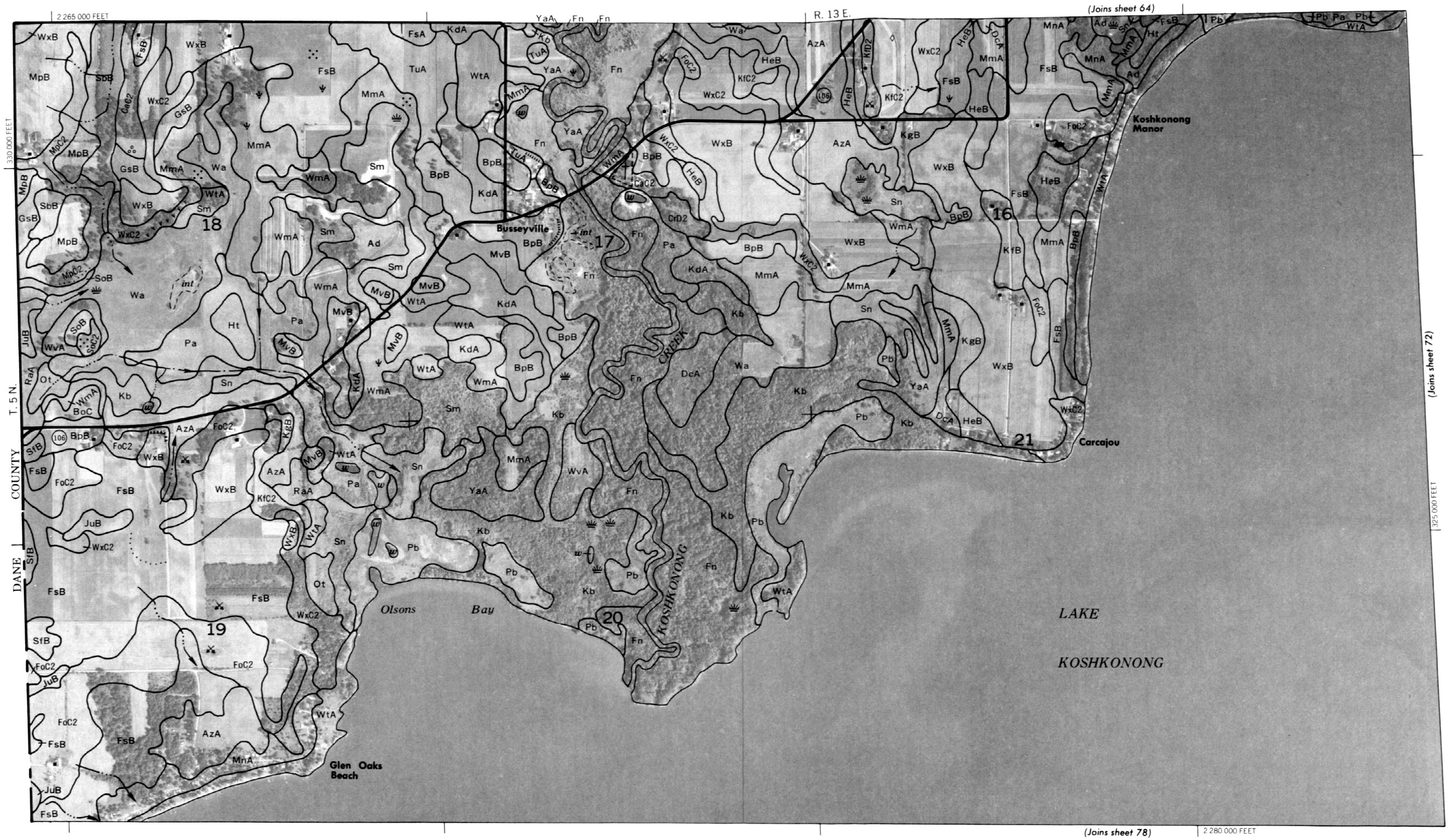
JEFFERSON COUNTY, WISCONSIN NO. 69

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 7

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



71

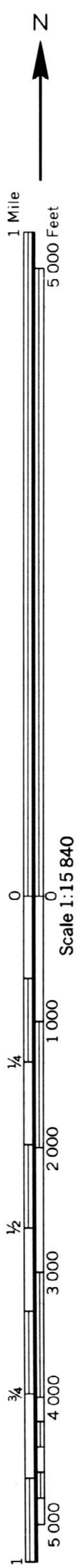
N

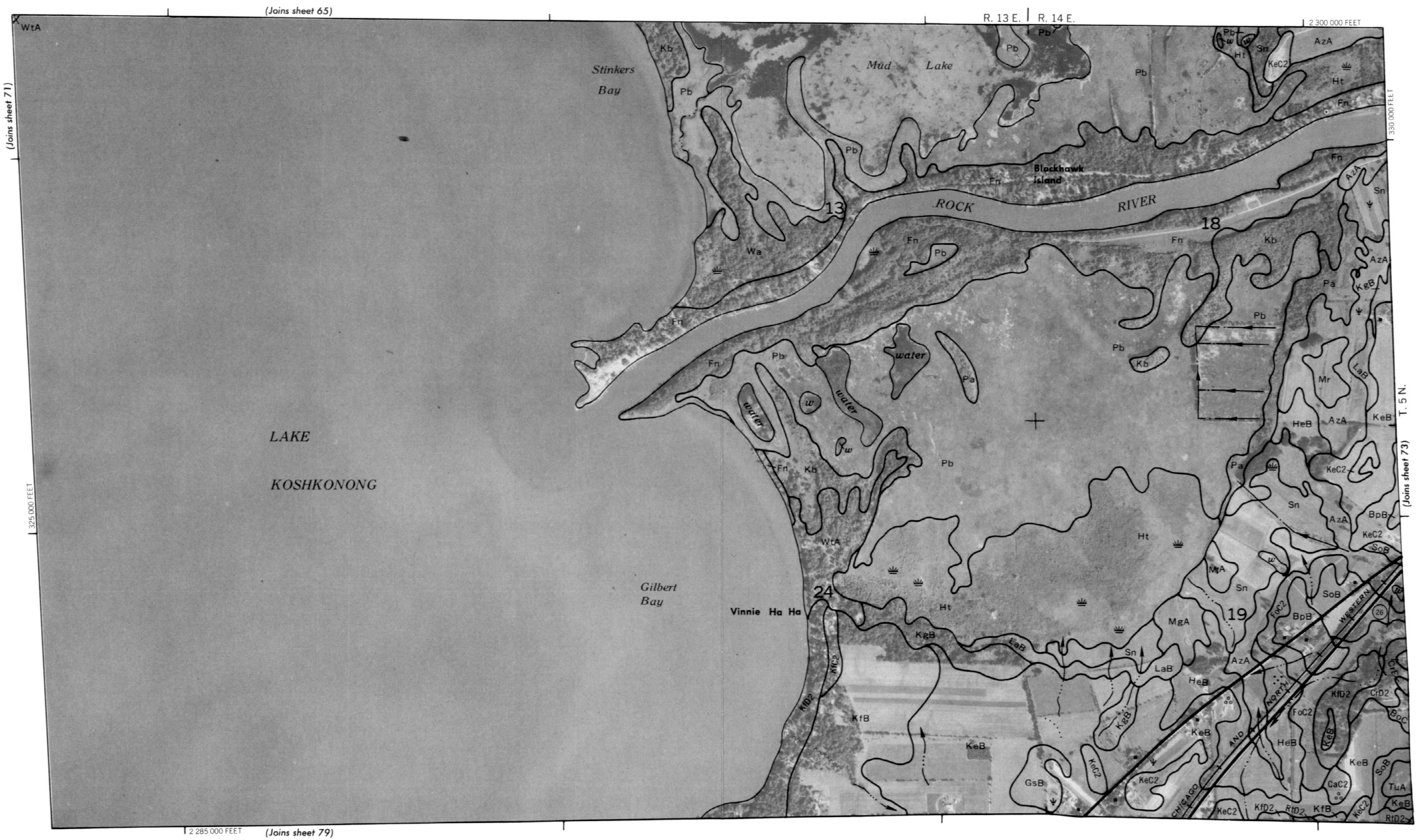
1 Mile
5 000 Feet
Scale 1:15 840

JEFFERSON COUNTY, WISCONSIN NO. 71

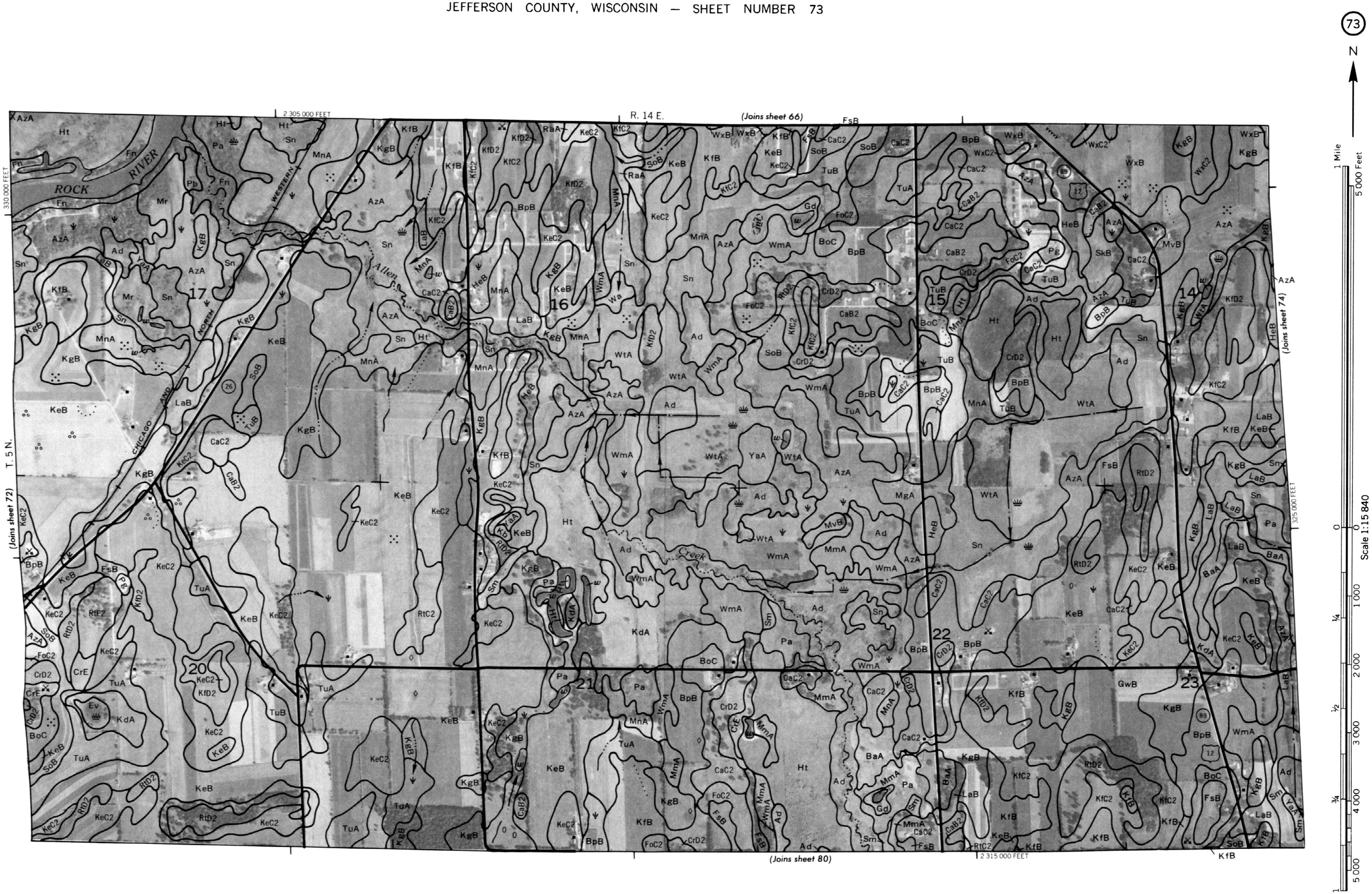
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

72





This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



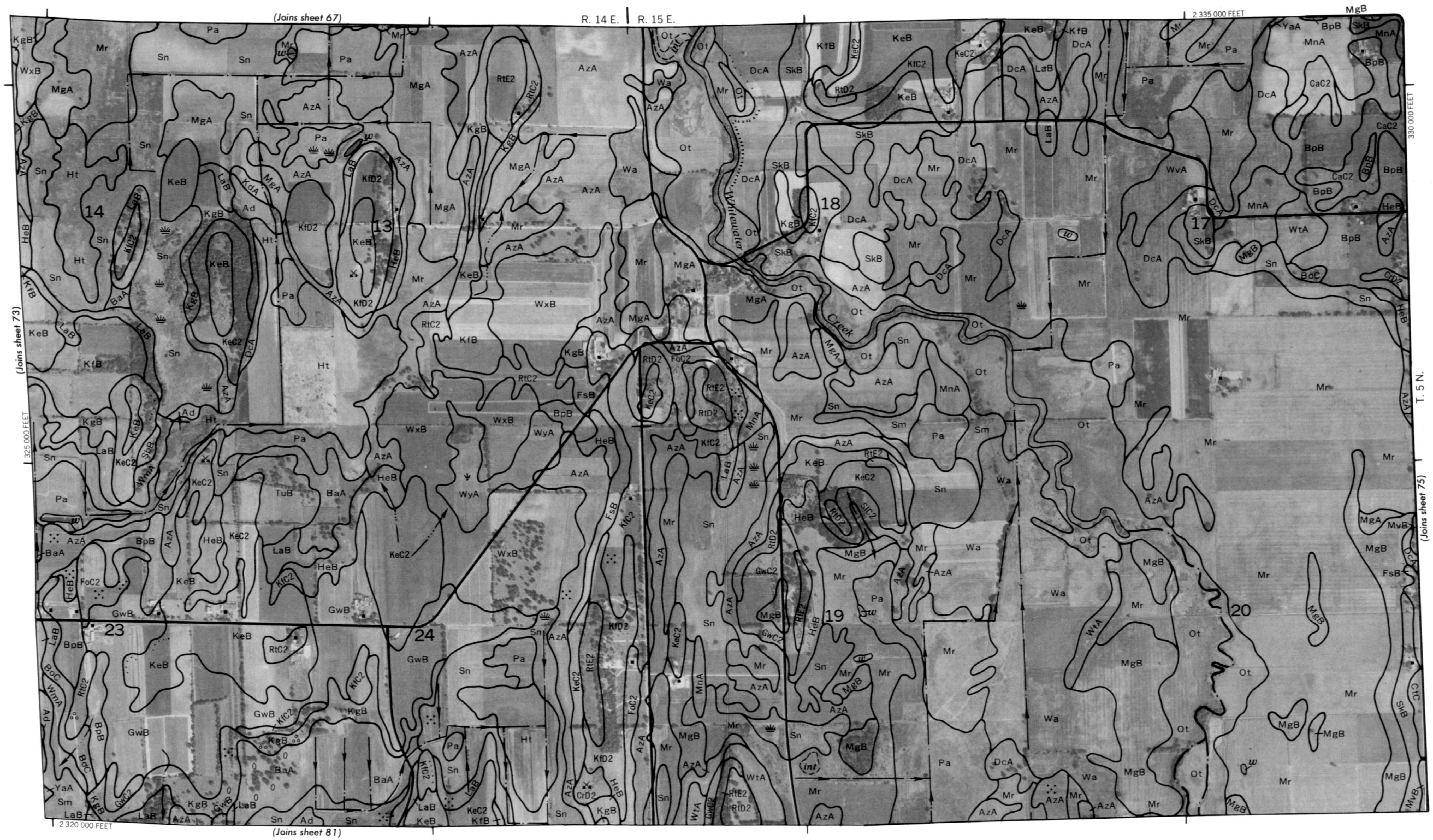
JEFFERSON COUNTY, WISCONSIN NO. 73

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 74

N

1 Mile
5 000 Feet
Scale 1:15 840



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 74

JEFFERSON COUNTY, WISCONSIN NO. 75

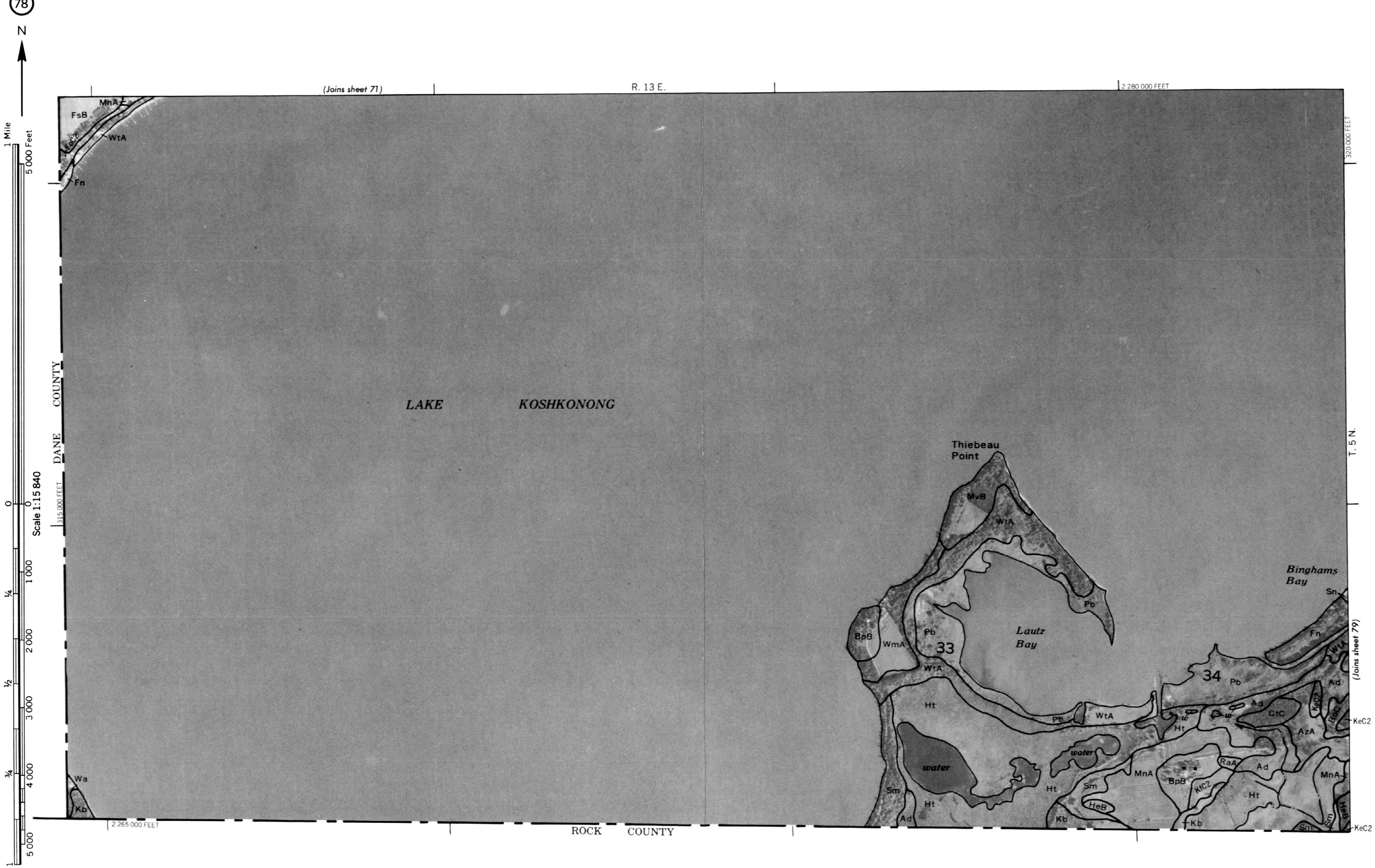
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN — SHEET NUMBER 76

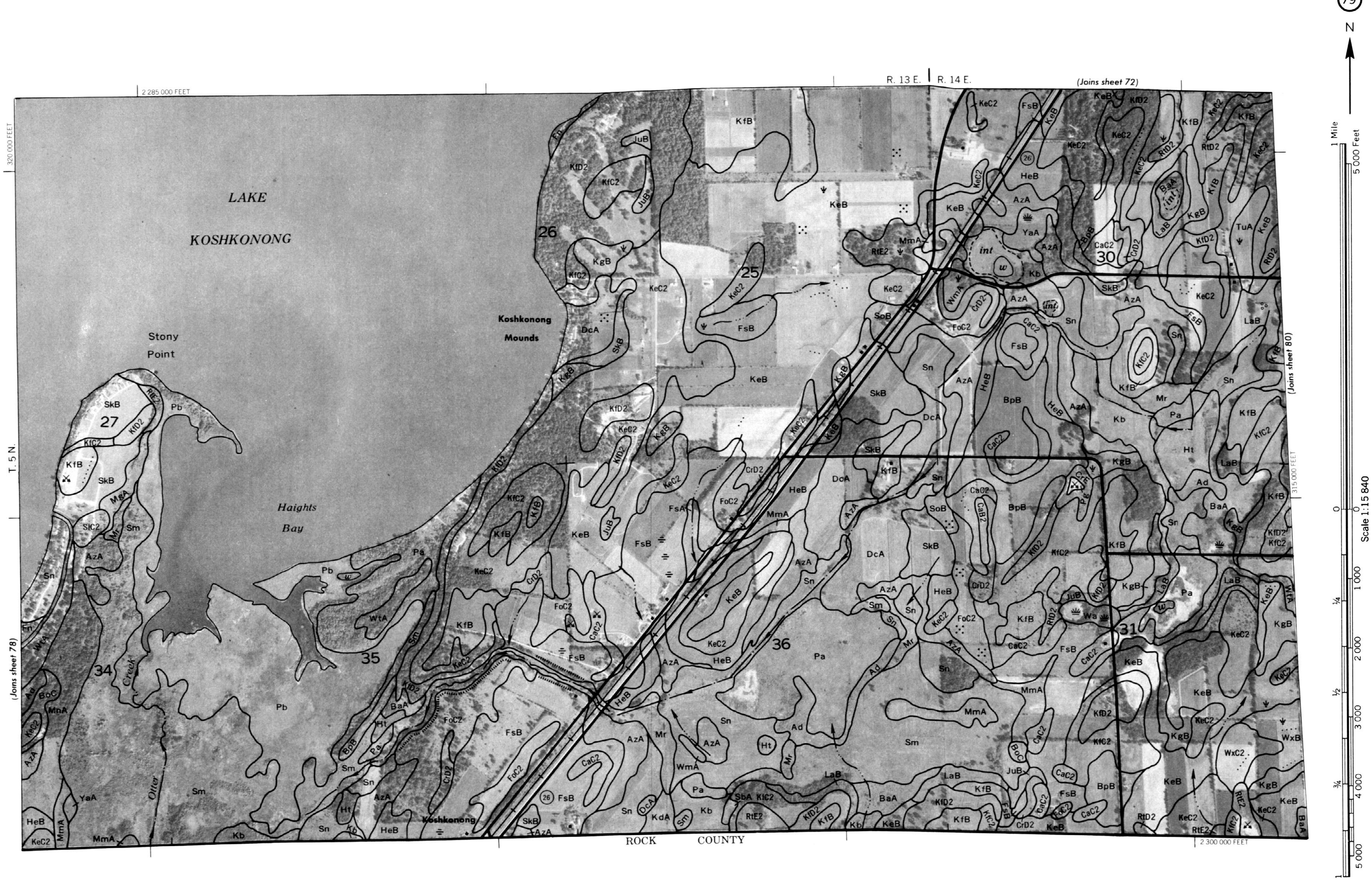
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 77

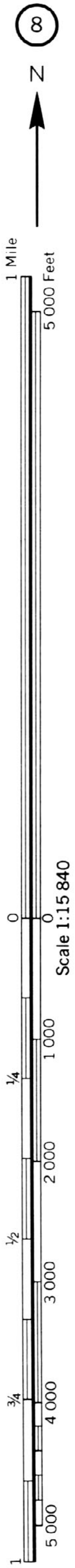
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

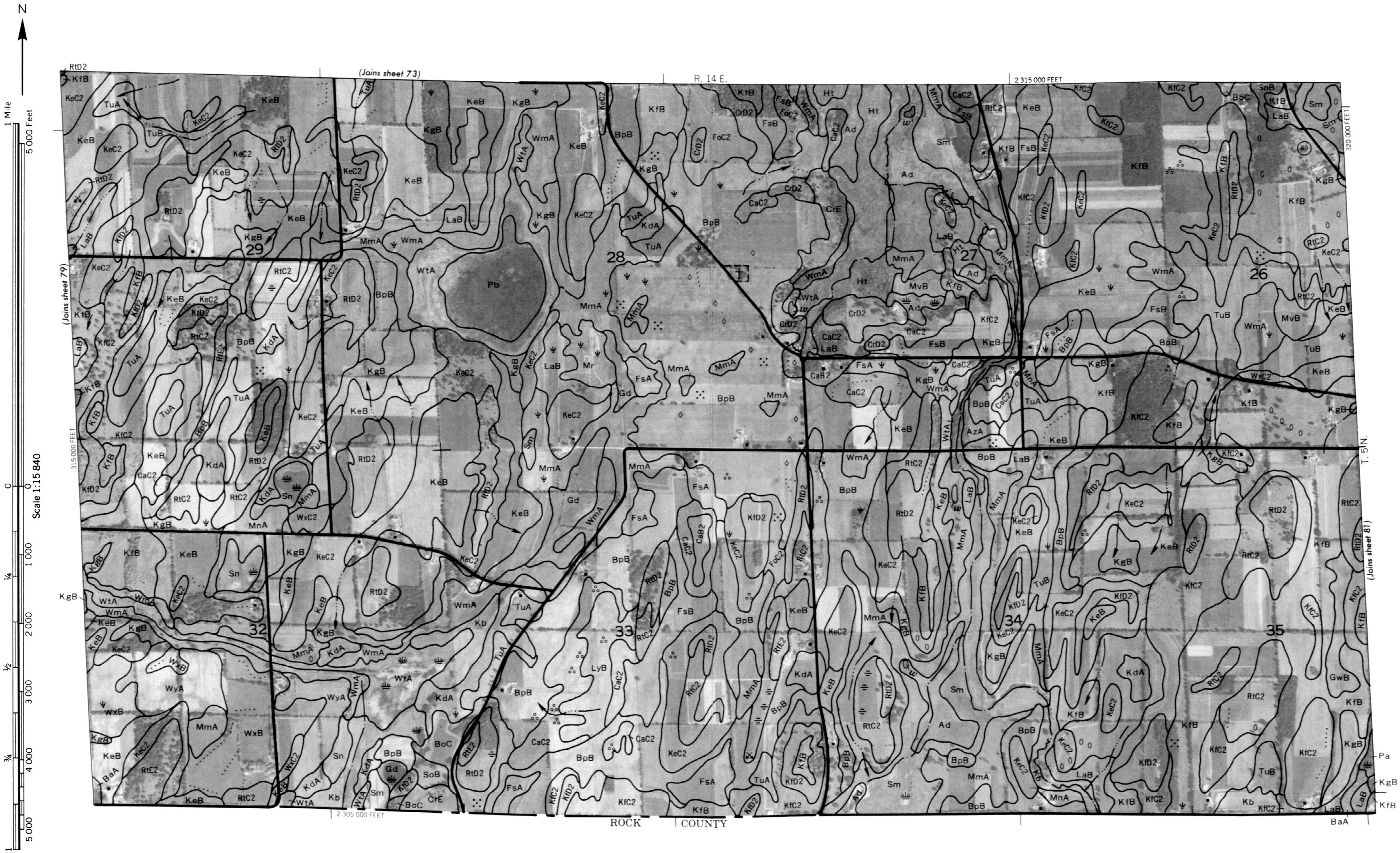


JEFFERSON COUNTY, WISCONSIN NO. 79
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

80



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 80

JEFFERSON COUNTY, WISCONSIN NO. 81

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

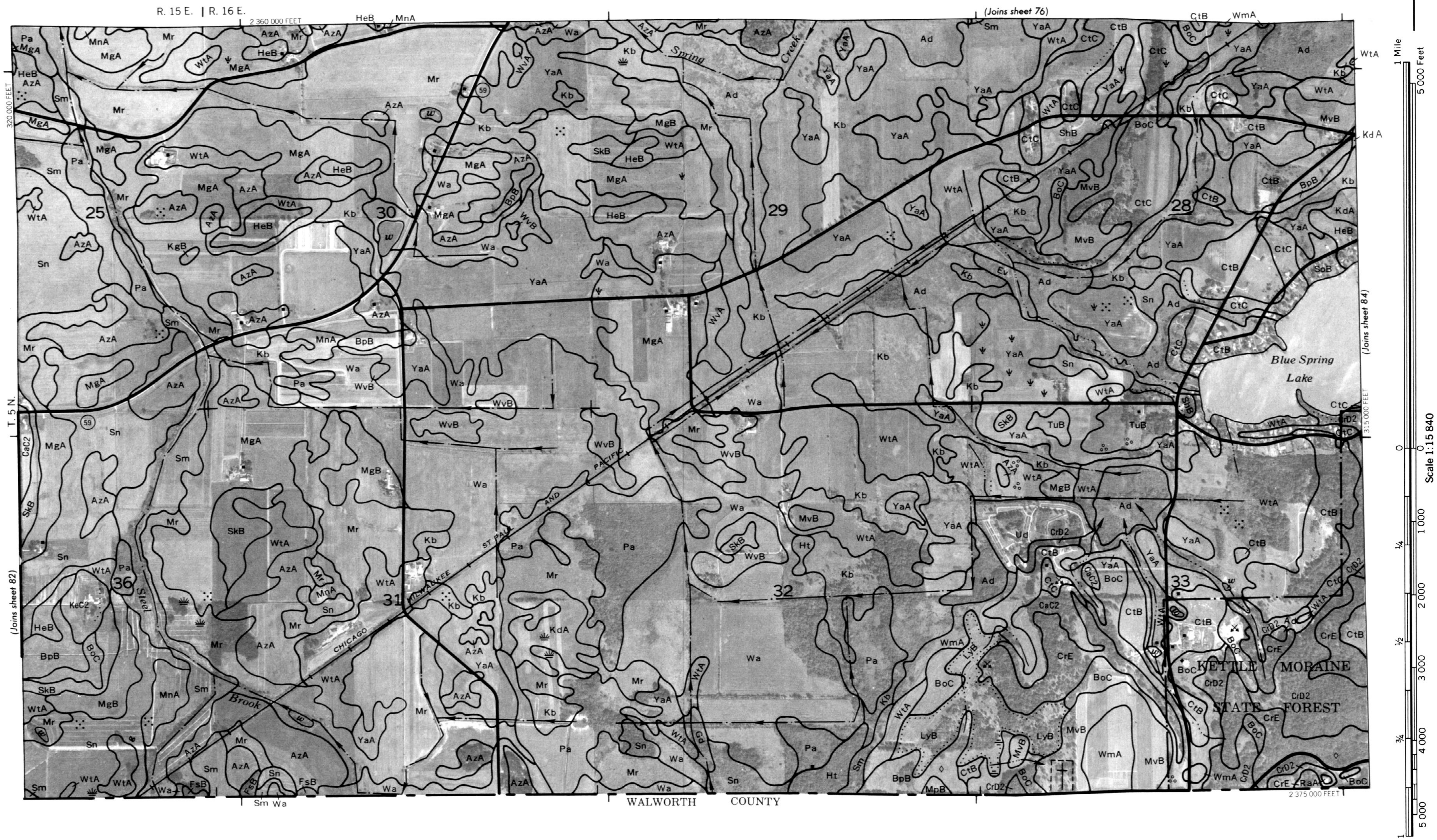
82

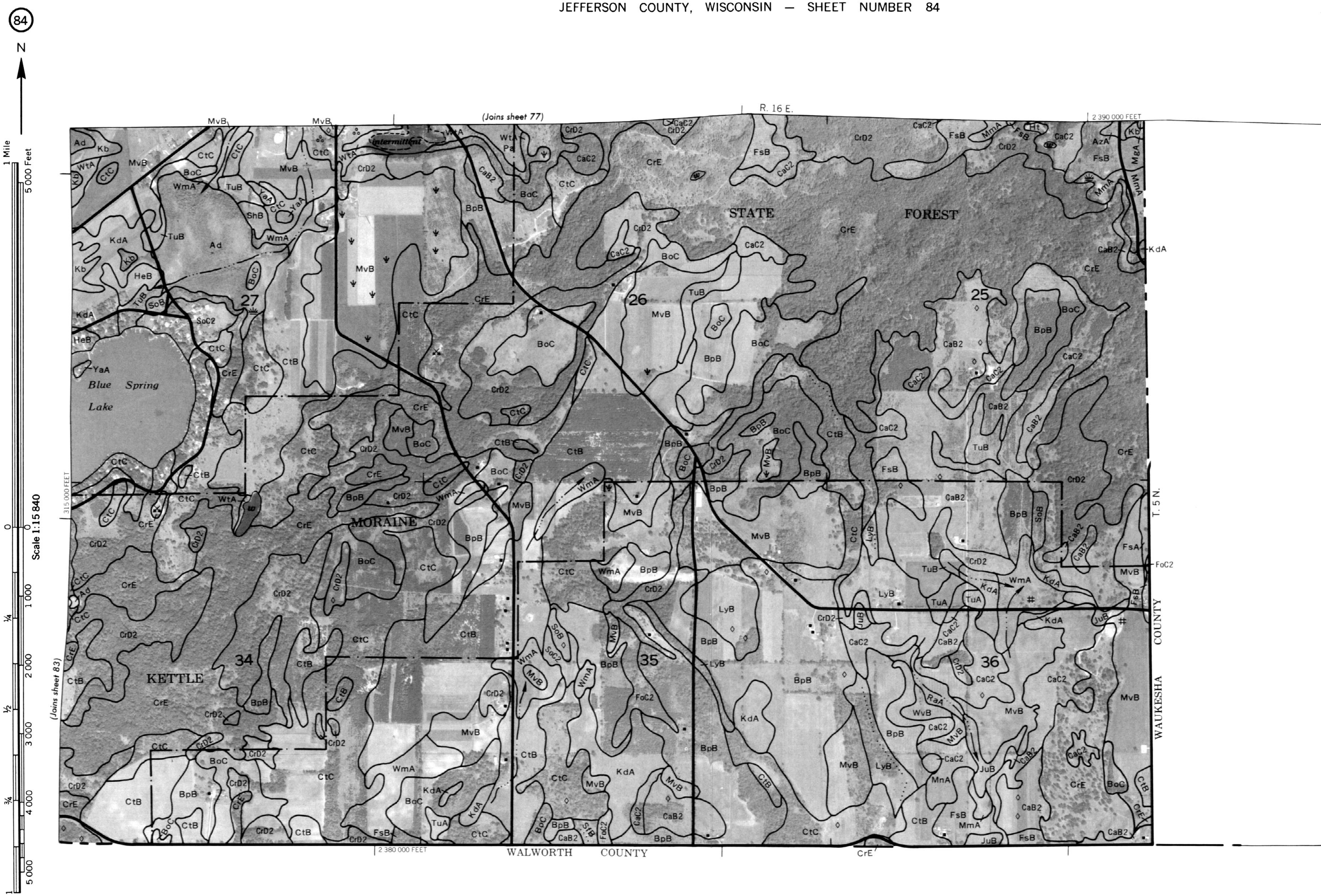
N

1 Mile
5 000 Feet
Scale 1:15 840
0 ¼ ½ ¾ 1
0 1 000 2 000 3 000 4 000 5 000

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, WISCONSIN NO. 82


N
R. 15 E. | R. 16 E.
2 360 000 FEET
(Joins sheet 76)
320 000 FEET
T. 5 N.
(Joins sheet 82)
(Joins sheet 84)
315 000 FEET
2 375 000 FEET
WALWORTH COUNTY
25
29
30
28
31
32
33
36
Spring Creek
Blue Spring Lake
Brook
KETTLE MORAINE STATE FOREST
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
59
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

9

JEFFERSON COUNTY, WISCONSIN NO. 9

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.